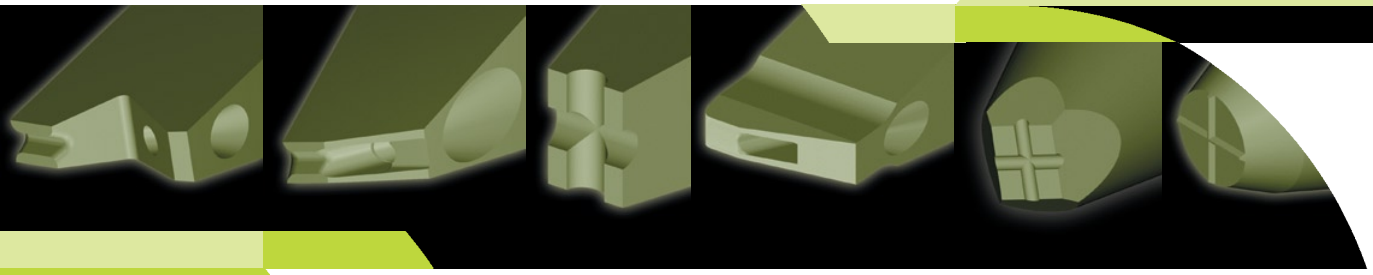
# Gold & Aluminum Bonding **Wedges**



## **Bonding** Spectrum

small precision tools

## Global Vision . Worldwide Network . Local Presence .

The SPT Roth Group's strategy centers on developing the Company into an integrated global corporation. Over the last twenty years, we have built on our global vision and invested in building manufacturing and sales facilities strategically around the world to be close to our customers.

The worldwide network combined with excellent logistic facilities ensures prompt and full compliance with customer requirements including ship-to-stock or just-in-time delivery programs. Dedicated and highly qualified sales and service engineers and application specialists ensure that customers receive professional service and support at all times from the design phase to starting mass production.

small precision tools

## Pioneer . World Leader .

Small Precision Tools - SPT - is the pioneer and leader of semiconductor bonding tools for over three decades.

SPT is the only bonding tool manufacturer internationally established with marketing and production centres strategically positioned all over the globe, to

1890
ROTH Group
Lyss, Switzerland

1964
Aprova Ltd.
Lyss, Switzerland

1974
Small Precision Tools Inc.
California, USA

1979
SPT Asia Pte Ltd.
Singapore

1982
Moldinject, Perfectamould AG.
Lyss, Switzerland

1991
Small Precision Tools (Phils.) Inc.
Manila, Philippines

1995
Small Precision Tools Co. Ltd.
Wuxi, China

2001
SPT Japan Co.,Ltd.
Yokohama, Japan

## Creative Solutions . Research & Development . Customer Partnership .

Customer partnership is our belief. At SPT, we listen to our customers. Because, every customer's needs are different, every solution is uniquely designed to satisfy those needs in the most effective way.

SPT offers a wide range of proactive support and services such as consulting, design, analysis, training seminars and benchmarking partnerships. SPT's material and process technology laboratories in Switzerland and Singapore offer technical support and services such as

## Quality . Product & Service Excellence .

SPT is committed to quality and customer care. Our commitment to product excellence and continued support of our customers is part of the sustaining culture of SPT.

SPT's partnership philosophy has earned numerous prestigious awards and

Research Development Design Partnership

Evaluation Optimization Precision Technology Training Excellence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**Product Technology . Excellence . Unsurpassed .**

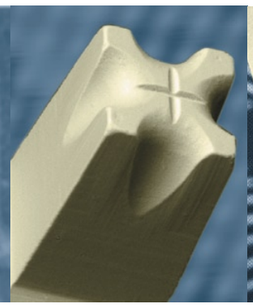
SPT positions itself as a progressive high-technology tool manufacturer using state-of-the art processes. Our production capabilities range from conventional to CNC machining including milling, turning, surface grinding, honing, Electro-Discharge Machining or EDM, jig grinding and more. Our exclusive Injection Molding technology of small complex parts through SPT's own in-house formulation and sintering assures customers of the highest quality in high alumina ceramic and carbide materials.

Our equipment and manufacturing techniques are the most advanced in the ultra precision tool industry.

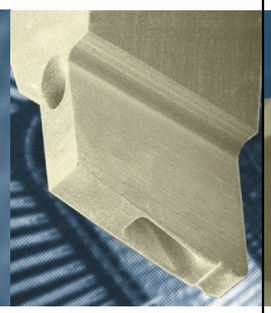
We make standard and custom designs for specific customer requirements. All

Bonding Capillary

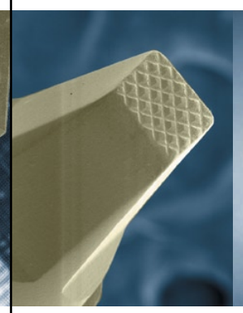
µBGA Tab Tool



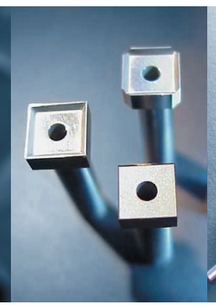
Fine Pitch Bonding Wedge



Waffle Tab Tool



Die Attach Collets



Bushings

Precision Parts

CIM & MIM Parts

Watch Gear

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## CONTENTS



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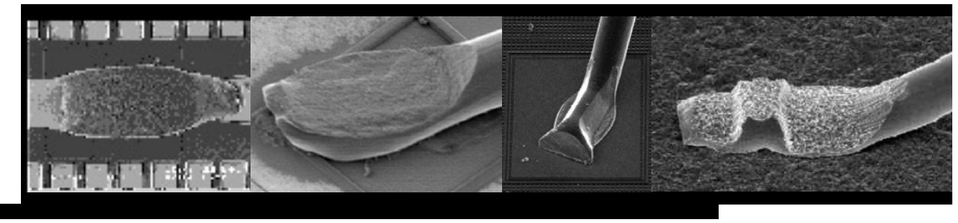
## TECHNOLOGY OVERVIEW



*Ultrasonic wedge bonding (SM & LW wire).*

The most commonly used method of connecting semiconductor devices to the ‘outside’ world is via gold or aluminum wire, ranging from .0005”/13µm to .003”/76µm for Au wire and .0008”/20µm to .020”/508µm for Al wire. The tip of the wedge vibrates parallel to the bonding wire. The weld is created by deforming the wire at a low temperature in which the energy for the weld formation is supplied from an ultrasonic transducer vibrating (60 to 120 kHz) the bonding tool or wedge. Aluminum wires are connected ultrasonically, gold wires using thermosonic welding (combination of heat 150° - 250°C and ultrasonic energy).

Wedge Bonding is a perennial technology for a niche market. In the early years of semiconductor, wedge bonding is commonly being used as a method of interconnection for Semiconductor Devices, Diode and single Transistor. At present, wedge bonding is popular for COB, Discrete, Hybrid, Hermetic and High Power Devices. With the many benefits that wedge bonding can offer such as deep access, fine pitch, and low and short loops bonding, it became a well known technique that is extensively being used in microwave and optoelectronics applications.

The low temperature wedge bonding is also attractive for some applications like Flex circuits as this helps prevent the softening of adhesive layers on the flex. Softened flex will absorb more of the ultrasonic energy during bonding resulting to poor bond reliability.

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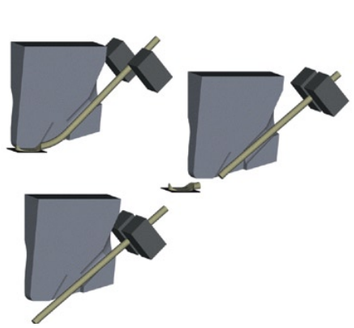
## BASIC ULTRASONIC WEDGE BONDING PROCESS

The ultrasonic bonding process typically started by feeding the wire at an angle usually 30-60˚ from the horizontal bonding surface through a hole in the back of a bonding wedge. Normally, forward bonding is preferred, i.e. the first bond is made to the die and the second is made to the substrate. The reason is that it can be far less susceptible to edge shorts between the wire and die. By descending the wedge onto the IC bond pad, the wire is pinned against the pad surface and an U/S or T/S bond is performed. Next, the wedge rises and executes a motion to create a desired loop shape. At the second bond location, the wedge descends, making a second bond. During the loop formation, the movement of the axis of the bonding wedge feed hole must be aligned with the center line of the first bond, so that the wire can be fed freely through the hole in the wedge. Several methods can be used to end the wire after the second bond. For small wires (<.003”/76µm), clamps can be used to break the wire while machine bonding force is maintained on the second bond (clamp tear), or the clamps remain stationary and the bonding tool raises off the second bond to tear the wire (table tear). The clamp tear process offers a slightly higher yield and reliability than the table tear process due to the force maintained on the second bond during the clamp tear motion. The clamp tear process also offers a slight speed advantage over the table tear process due to fewer required table motions. However, the table tear process, has a higher wire feed angle capability and stationary clamp, has the potential to provide slightly more clearance from package obstructions such as a bond shelf or pin grid. For large bonding wires (>.003”/76µm), the most common method is using a cutter blade. Once the wire is terminated, the wedge ascends. The clamped wire is fed under it to begin bonding the next wire…this process will repeat until the wire bond program is complete.



**Clamp tear**

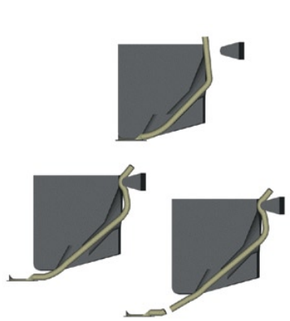
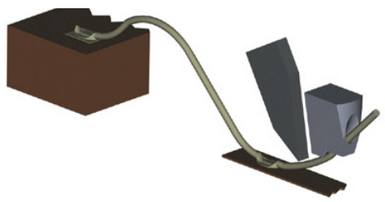
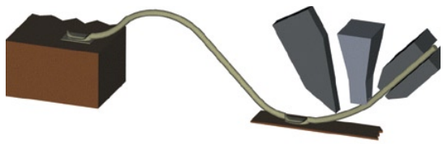


**Table tear**



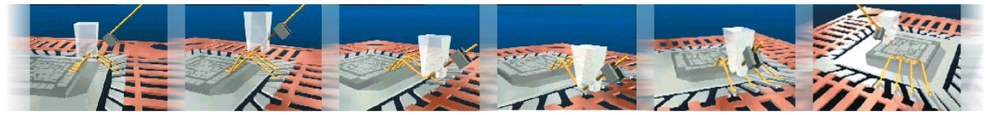


**Guillotine termination methods**





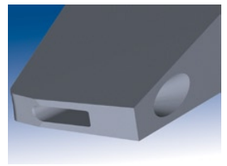
Wedge bonding technique can be used for both aluminum wire and gold wire bonding applications with some slight modification to the back radius to compensate for the lower tensile strength of gold wire. The principle difference between the two processes is that the aluminum wire is bonded in an ultrasonic bonding process at room temperature, whereas gold wire wedge bonding is performed through a thermosonic bonding process with heat up to 175˚C. A considerable advantage of the wedge bonding is that it can be designed and manufactured to very small dimensions, down to 50µm pitch. Aluminum ultrasonic bonding is the most common wedge bonding process because of the low cost and can be bonded at room temperature. The main advantage for gold wire wedge bonding is the possibility of avoiding the need for hermetic packaging after bonding due to the inert properties of the gold. In addition, a wedge bond will give a smaller footprint than a ball bond, which specially benefits the microwave devices with small pads that require a gold wire junction down to .0005”/ 13µm.



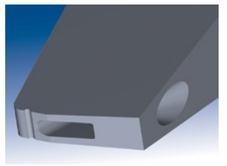
### BONDING WEDGE TOOLS

Wedge bonding is performed using a wedge-shaped bonding tool. The wire in wedge bonding is addressed at an angle (30º to 60º) through the rear of the wedge. When special clearance is necessary the wire will be fed at 90° through a hole in the shank for maximum clearance. Low angle wire feed style gives best placement control and tail consistency under the bond foot. High angle wire feed is only used when absolutely necessary due to high package walls where the bonding to the edge of the die is necessary. Tail control and bond placement accuracy is less consistent due to the steep feed angle which causes the wire tail to contact the pad prematurely causing the wire to shift away from underneath the bonding tip or be pushed back into the feed hole. Unlike at lower feed angles (30° to 45°) the wire is in line with the tip. Foot profile of the wedge can be either flat or concave. Most of the automatic aluminum wire applications use the concave foot to reduce wire positioning errors. The flat foot is used mainly with gold wire or with aluminum wire to obtain extremely short bonds. A groove foot has been designed for gold wire wedge bonding to improve the wedge-to-wire gripping. The material used for the wedge is dependent on the bonding wire material. For aluminum wire, the wedge is made of tungsten carbide. For gold wire, the material used is titanium carbide or cermet tip. The cermet tip wedge is most commonly used in applications where low temperature Au to Au bonding is required.

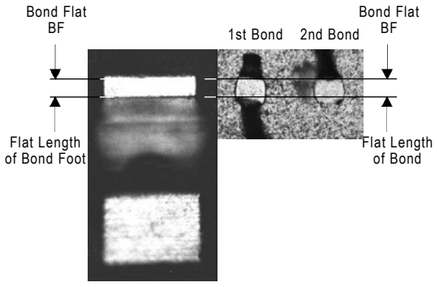
The parameters of the wedge can greatly affect the wire-bond characteristics. For the first bond, pull strength is affected by back radius (BR), bond location is influenced by hole size (H) and tail length is controlled by feed angle, hole shape and surface quality. The main wedge parameters that affect looping are hole size and shape, as well as feed angle. For the second bond, pull strength is defined mainly by front radius (FR), bond length and tail consistency is affected by back radius (BR).



*Wedge for Al wire wedge bonding*



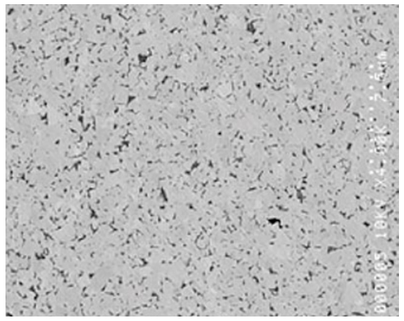
*Wedge for Au wedge bonding.*



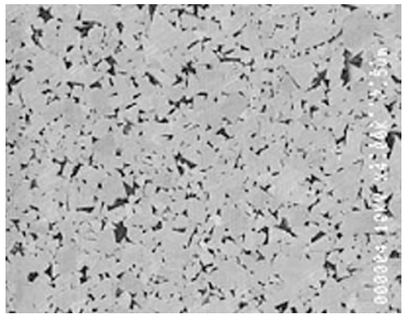

M45B-1507-L-FM .0007”/*18µm* wire

Another major feature of ultrasonic wedges is the Bond Flat (BF). The Bond Flat is defined as the length of the bonding tool foot that appears flat when measuring with a microscope at 300X will give a very close approximation to the actual bond length achieved during the bond process.

**Tungsten Carbide (W)** is widely used because of its extraordinary properties and is particularly suited for a variety of wear resistant tools.Tungsten Carbide is the most commonly used material for Aluminum wire and ribbon bonding. Our premium grade Tungsten Carbide provides efficient ultrasonic energy transfer due to its uniform, high density, fine grain structure.



**SPT premium grade fine grain Tungsten Carbide Material**



**Tungsten Carbide from another supplier**

**Titanium Carbide (TI)** ) is the typical choice for gold wire and ribbon bonding applications. Titanium Carbide is a sintered alloy of Titanium and various binders. Our material is an industry recognized standard for gold wedge bonding. SPT supplies high quality Ti Carbide tools for standard bonding applications and fine pitch wedge and ribbon bond tools with high structural integrity.

**Cermet (C)** is an optional material for gold wire, ribbon and TAB applications at lower bonding temperatures. The naturally coarse texture of our ceramic-metal alloy “Cermet” provides enhanced ultrasonic coupling, allowing reduced bonding parameters, gentler touchdown and extended tool life. All Cermet bonding tools are manufactured using a two piece construction. SPT’s proprietary brazing technique creates a uniform, ultra thin brazed joint with our Tungsten Carbide shank, allowing seamless ultrasonic transfer equivalent to a unibody carbide wedge.

**Microloy (M)** is the latest addition to the SPT bonding tool product line. In the 1970’s, Microminiature Technology, Inc. discovered that an Osmium (Os) based carbide alloy had a set of properties that made it an ideal material for the tips of bonding tools used in ultrasonic wire, ribbon and TAB bonding. Its wear-resistance and unique surface finishes allow for unparalleled ultrasonic coupling. The alloy was given the name “Microloy”, and its critical properties include:

- High density.
- High elastic modulus.
- Extreme hardness.
- Excellent wear resistance.
- Fine grain structure.
- Low porosity.





Microloy (M) is the material of choice for all types of difficult to bond applications. This material has the coupling advantages of Cermet with the added advantages of reduced build-up and it can be used with Aluminum, Gold and Platinum wire and ribbon. Microloy can be used to bond any type of bondable wire to any type of bondable substrate or die. This unique material is only available from SPT and its applications and advantages include:

- **LONGER TOOL LIFE**

  Typically,customers find the tool life several times longer because of wear-resistant osmium alloy at the tip of our tools. The consistency of Microloy makes the tool lifetime predictable and stable for a given application.

- **“LOW STRESS” BONDING**

  Because of the excellent ultrasonic coupling, many users of Microloy tools find that they can bond with less power, force, time and/or temperature, including room temperature bonding of gold wire at 60k Hz.

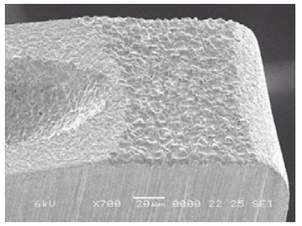
- **HIGHER RELIABILITY BONDS**

  The unique finishes possible with Microloy enhance the transmission of ultrasonic energy and improve the quality of the bond, especially with gold interconnects.

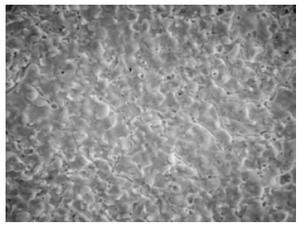
- **FINE PITCH BONDING WEDGES**

  The Microloy bonding tools are being used in a 35 micron pitch bonding process.

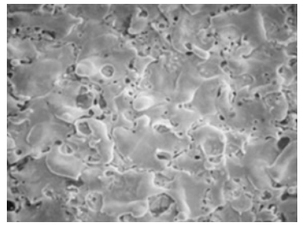
Microloy’s properties plus our state-of-the-art manufacturing expertise allow a unique bonding surface finish for efficient ultrasonic coupling, with minimal build-up for longer tool life.



*Wedge Bonding Tool Surface*



*Matte “M”*



*Frost “F”*

- High and consistent pull strength.
- Reduced bond power, force and time.
- Less deformation of bond.
- Eliminate cross-grooves.

## PROCESS DEVELOPMENT AND OPTIMIZATION:

The key stages generally include initial process design and development, process characterization, process control and process optimization. These stages form a continuous loop between characterization and control with periodic optimization and development.

In the initial stages of the process, process capabilities should be known to set achievable goals. The second stage (process characterization) is to collect and categorize the data on wire-bonding failures such as bond off center, bond not sticking on die, wire breaking and so on. Process control (the third stage) is important for a successful process. To achieve a stable performance, the operating variables such as bond program parameters, machine setup, operation procedures, bonding tool installation, wire pull procedures and product change must be minimized and consistent across the process, such as in the training of operators must be established. If the previous stages of process development are in place, process optimization can be performed. Once a process is operating in a production environment, statistical process control (SPC) can be applied to such items as destructive wire pull and non-destructive wire pull (commonly used in military products and large wire-bonding applications) to monitor the process and to minimize process drift.

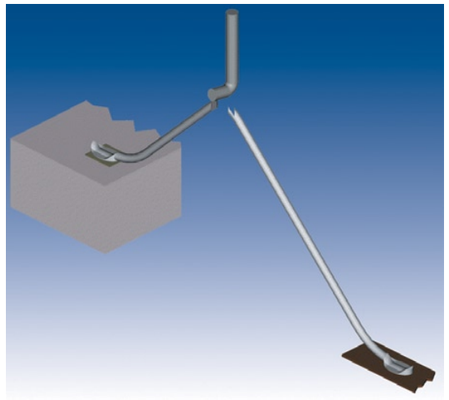
## BOND EVALUATION:

After bonding, the wire-bond can be evaluated with visual and mechanical testing. Depending on the customer requirements, the following are the three most common mechanical testing methods that are employed for the evaluation of bond strength.

1. Destructive bond pull test
2. Non-destructive bond pull test (most commonly used in military and automotive products)
3. Bond shear test (commonly used in wire dia. >.004”/100µm)

### Destructive Bond Pull Test:

Destructive pull test, i.e. bond pull strength test, is the primary method to evaluate the bond strength by hooking and pulling the bonded wire until failure occurs. The purpose of this test is to examine the bond strength and to certify the proper setup of the bonding machine parameters. The results are important evidences for evaluating bonding quality and reliability. The same results evaluate the understanding of bond failure mechanisms including bond pad cratering, over-bonding and shear fatigue at bonded interfaces during temperature cycling. Pull strength is strongly dependent upon the geometrical configuration of the pull test.



**Schematic of destructive pull test**





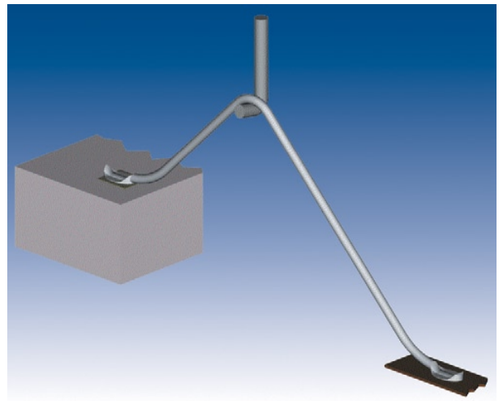
The failure during pull test may occur at one of the five positions in the wire-bond structure:

A. Lift off first bond
B. Wire break at transition first bond
C. Wire break mid span
D. Wire break at transition second bond
E. Lift off second bond

When the process is in control, the bond should fail at B or D. If failures occur at A, C, or E, then the bonding parameters, metallization, bonding machine, bonding tool, bonding wire and wire pull hook all have to be reviewed.

### Non-Destructive Bond Pull Test:

This test is a variation of the destructive pull test in that the maximum force applied to the bond loop is limited to a predetermined value. It is usually used to detect unacceptable wire-bonds while avoiding damage to acceptable wire-bonds. The most common failures are bond lifts, tight wires, heel cracks and cratering. The non-destructive pull test force is specified for a given wire diameter and metallurgy.



**Schematic of non-destructive pull test**

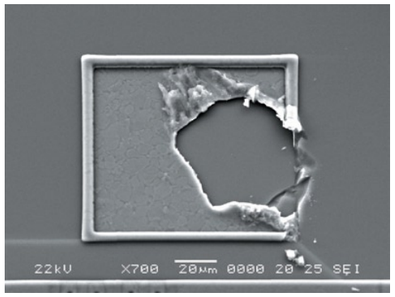
## FAILURE MECHANISMS OF WIRE-BONDS:

A major advantage of wire-bonding for microelectronic interconnection is its solid base of reliability from bond strength studies to time and temperature design factors. Many factors may degrade yield and reliability of the wire-bonds. Trouble shooting can be carried out using a “fishbone diagram” to isolate the errors in wire-bonding process. It is then possible to focus problem-solving effort on fewer aspects of the process.

**CRATERING OF A WIRE-BOND PAD:**

Cratering, typically occurring in ultrasonic bonding, is defined as damage to the semiconductor glass or other layers that lie under the bonding pad metallization. The damage may be in the form of a recognizable divot but more commonly takes the form of invisible structural damage. This damage can degrade the device characteristics and is often taken for electrical damage. Main causes of cratering are often targeted to the tool design but in most cases is related to the following:

- High ultrasonic energy can cause stacking faults to occur in the silicon lattice.
- Too low bond force can induce cratering in wedge bonds causing the tool to bounce/vibrate when the power and time is applied.
- Excessive tool-to-substrate impact velocity does not induce cratering in silicon but does on weaker crystals such as gallium arsenide.
- Too short of a tail can make the face of the bonding tool contact the metallization.
- Heavy probing may lead to chip damage under the influence of the applied ultrasonics.
- Best bonds are made when the pad and wire hardness match which is the optimum condition for minimum cratering.
- Harder wire can cause silicon craters during aluminum ultrasonic bonding.




**Cratering**

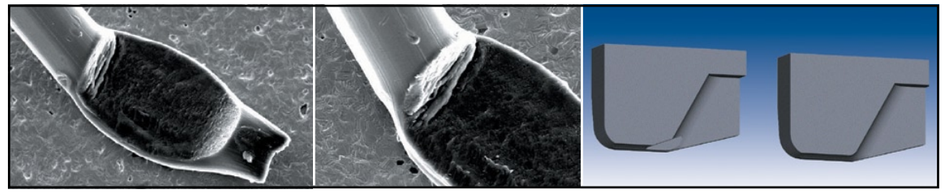
**WIRE-BOND FRACTURE AND LIFT-OFF:**

The heel of the bond is already overworked (weakened) during ultrasonic welding and flexing forward and backward is often sufficient to form a crack. Metallurgical crack formation is a critical issue for wire-bonding process. The crack often forms in the heel of the first bond of aluminum wedge bonding. The following reasons can cause heel cracks:

- Using a sharp heeled bonding tool.
- Operator motion of the pedestal (if a manual bonder is used).
- Excessive bond deformation.
- Rapid-tool movement after first bond.

High loops can lead to greater tool motion and an increased probability of heel cracking. The cracks can be enhanced when the second bond is significantly lower than the first, typical of reverse bonding since the wire is bend backwards more than if bonds are on the same level. Heel cracking can reduce pull strengths by up to 40% and can also lead to premature cycling failures. An enhancement feature that can be added to the Back Radius to minimize heel cracks is the Chamfered Back Radius (CBR), a common design feature recommended only when heel cracks are a problem. Overcompensation in the removal or prevention of heel cracks may cause inconsistencies in wire termination which can result in ‘missing wire’ and inconsistent tail length problems.





*SEM of Bond with Cracked Heel* *CBR Wedge Profile*

**Heel Crack & CBR Wedge Profile**



**INCONSISTENT TAILS:**

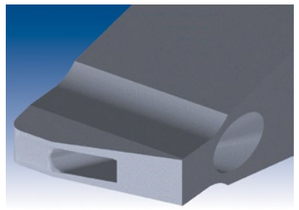
This is the most common problem encountered in wedge bonding and one of the most difficult to cure as it can be caused by any of the following:

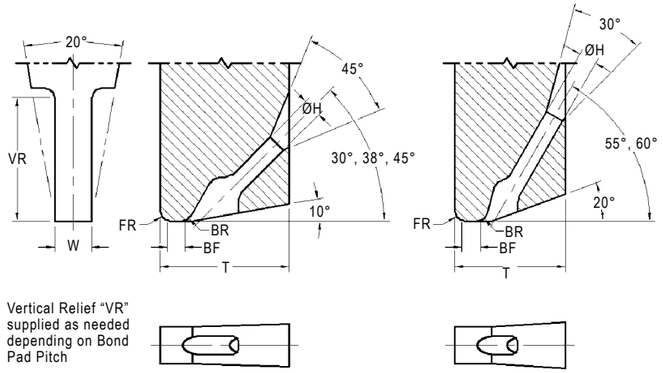
- Dirty wire path
- Incorrect wire feed angle
- Partially blocked wedge
- Dirty wire clamps
- Incorrect clamp gap
- Incorrect clamp force
- Faulty feed/tear mechanism
- Incorrect wire tension
- Incorrect radii (to large)

Too short a tail means that the force on the resulting first bond is distributed over a much smaller area leading to excessive deformation. Too long a tail may lead to shorting between pads.

## FP SERIES - FINE PITCH BONDING TOOL

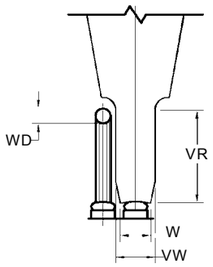
There are a number of technical challenges unique to fine pitch wire-bond process. It includes a broad mix of component technologies. A typical package may contain 200 different components ranging in size from (.008 inch X .008 inch) and .004 inches thick to (.500 inch X .500 inch). The sheer number of different sized chips and tight chip-to-chip spacing create problems in accessing the bond pads. Fine pitch wire-bonding is of particular importance in the manufacturing of these devices. Fine pitch is defined as 100 microns or less center-to-center distances between bond pads. Many devices use the latest high performance chips that typically include 4 mil pitch bond pads. Innovations in tool configurations, machine vision systems and wire-bonding ultrasonics have been critical to improved fine pitch wedge bonding






**STANDARD DIMENSIONS**

| Tool Styles | Wire Feed Angle | Hole / Bond Flat | Hole H in / *µm* ±.00015/*3.8* | Bond Flat BF in / *µm* ±.00015/*3.8* | Foot Width W in / *µm* ±.0002/*5* | Tip Thickness T 30° in / *µm* ±.0005/*13* | Tip Thickness T 38°/45° in / *µm* ±.0005/*13* | Tip Thickness T 55°/60° in / *µm* ±.0005/*13* | Useable Wire Diameter in / *µm* |
|---|---|---|---|---|---|---|---|---|---|
| FP30 | 30° | 1507 | .0015 / *38* | .0007 / *18* | .0030 / *76* | .0140 / *356* | .0140 / *356* | .0120 / *305* | .0005 / *13* through .0008 / *20* |
| | | 1510 | .0015 / *38* | .0010 / *25* | .0030 / *76* | .0140 / *356* | .0140 / *356* | .0120 / *305* | |
| | | 1515 | .0015 / *38* | .0015 / *38* | .0030 / *76* | .0140 / *356* | .0140 / *356* | .0120 / *305* | |
| | | 1520 | .0015 / *38* | .0020 / *51* | .0030 / *76* | .0140 / *356* | .0140 / *356* | .0120 / *305* | |
| FP38 | 38° | 2010 | .0020 / *51* | .0010 / *25* | .0030 / *76* | .0150 / *381* | .0140 / *356* | .0120 / *305* | .0008 / *20* through .0010 / *25* |
| | | 2015 | .0020 / *51* | .0015 / *38* | .0030 / *76* | .0150 / *381* | .0140 / *356* | .0120 / *305* | |
| FP45 | 45° | 2020 | .0020 / *51* | .0020 / *51* | .0030 / *76* | .0150 / *381* | .0140 / *356* | .0120 / *305* | |
| | | 2025 | .0020 / *51* | .0025 / *64* | .0030 / *76* | .0190 / *483* | .0140 / *356* | .0120 / *305* | .0010 / *25* through .0013 / *33* |
| FP55 | 55° | 2520 | .0025 / *64* | .0020 / *51* | .0040 / *102* | .0190 / *483* | .0140 / *356* | .0140 / *356* | |
| | | 2525 | .0025 / *64* | .0025 / *64* | .0040 / *102* | .0190 / *483* | .0140 / *356* | .0140 / *356* | |
| FP60 | 60° | 2530 | .0025 / *64* | .0030 / *76* | .0040 / *102* | .0190 / *483* | .0140 / *356* | .0140 / *356* | |
| | | 3025 | .0030 / *76* | .0025 / *64* | .0040 / *102* | .0200 / *508* | .0190 / *483* | .0170 / *432* | .0015 / *38* through .0020 / *51* |
| | | 3030 | .0030 / *76* | .0030 / *76* | .0040 / *102* | .0200 / *508* | .0190 / *483* | .0170 / *432* | |
| | | 3035 | .0030 / *76* | .0035 / *89* | .0040 / *102* | .0200 / *508* | .0190 / *483* | .0170 / *432* | |




VR Set "A" 70µm to 80µm BPP
W = .0030", VW = .0040", VR = .0060"

VR Set "B" 60µm to 70µm BPP
W = .0025", VW = .0030", VR = .0060"

VR Set "C" 50µm to 60µm BPP
W = .0020", VW = .0025", VR = .0060"
Max HW = .0015", for WD = .0010" or less
Oval Hole



## FP SERIES - GENERAL GUIDELINES ON HOW TO ORDER

| STYLE | FEED ANGLE |
|---|---|
| FP = Fine Pitch Standard Design | 30°, 38°, 45°, 55°, 60° |

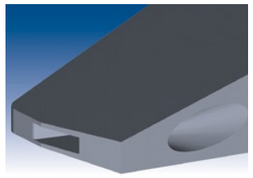
| RADIUS SET | Wire Material | Wire Diameter | Hole Size | FR ± .0001/*3* | BR ± .0001/*3* |
|---|---|---|---|---|---|
| A | Aluminum / Gold | .0010 / *25* - .0015 / *38* | .0015 / *38* - .0030 / *76* | .0010 / *25* | .0010 / *25* |
| B | Gold | .0010 / *25* - .0015 / *38* | .0015 / *38* - .0030 / *76* | .0010 / *25* | .0006 / *15* |
| B | Aluminum | .0007 / *18* - .0010 / *25* | .0015 / *38* - .0020 / *51* | .0010 / *25* | .0006 / *15* |
| C | Gold | .0005 / *13* - .0010 / *25* | .0015 / *38* - .0020 / *51* | .0004 / *10* | .0004 / *10* |

| | MATERIAL | HOLE / BOND FLAT | TOOL LENGTH (TL) |
|---|---|---|---|
| **C** | Cermet composite for Gold Wire (recommended for Low Temperature bonding) | Will rely on specific application requirements (wire diameter used, bond pad size) – see dimension Table | S = .437 / *11.1 mm* |
| **M** | Microloy (Osmium-Carbide Alloy) for Gold & Aluminum Wire | * For Oval Hole options please specify HH (Hole Height) & HW (Hole Width) | ¾ = .750 / *19.05 mm* |
| **TI** | Titanium Carbide Composite for Gold Wire | | L = .828 / *21.0 mm* |
| **W** | Tungsten Carbide Ultra Fine Grain for Aluminum Wire | | 1.00 = 1.00 / *25.4 mm* |
| | | | Longer lengths are available consult Bonder manufacturer for specifications. |

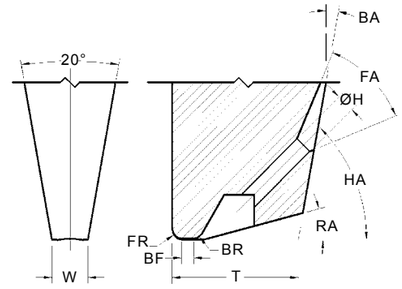
| FOOT OPTIONS | |
|---|---|
| **C** | Concave foot design with polished FR and BR with fine matte finish on BF (matte most commonly used with *Aluminum wire*) for best results specify when the BF is greater than .0015"/*38*µm. |
| **CM** | Concave foot design with FR, BR and BF matte (for *Aluminum and Gold wire*) |
| Flat (Optional) | |
| **FM** | Flat foot design FR, BR and BF are matte (for *Gold Wire*) or wire diameter less than .0013"/*33*µm and BF is less than .0015"/*38*µm |
| **CGM** | Cross Groove with FR and BR matte (for *Gold Wire*) with a matte Flat BF. Most commonly used on manual and semi automatic bonders where pad size restrictions is not an issue. Not recommended for BF smaller than .0020"/50µm |
| **CCM** | Cross Groove with FR and BR matte (for *Gold Wire*) with a matte Concave BF. Most commonly used on automatic bonders where wire control is critical and pad size is limited. Not recommended for BF smaller than .0020"/50µm |

| HOW TO ORDER | | |
|---|---|---|
| **SPECIFY** | **Style/Radius Set – Material – Hole/Bond Flat – Tool Length – Foot Option**<br>(For Fine Pitch application below 80µm BPP, refer to page 8 for VR sets to specify, otherwise specify VR and VW) or contact our technical support staff for assistance with your requirements. For Special Shank Style refer to page 61. | |
| **EXAMPLE** | FP45A - W - 2020 - L - CM | 180 - DEG - REV |
| | FP38B - TI - 1515 - ¾ - FM | VR = Set B |
| | FP60B - C - 2025 - L - CGM | VR = Set A |
| | FP55B-TI-1520-3/4-CGM | HH = .0020 HW=.0015 VR Set C |

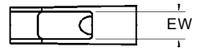
## US/UT SERIES - UNIVERSAL BONDING TOOL



The US/UT design incorporates all the latest technical features in semiconductor wire bonding tool designs and is widely used by every bonder manufacturer in the world. The 60º heel with the more squared back or radius area normally will produce a short tail. This tool style is most commonly used where fine pitch bonding is not required.




UT has a 10° BA
US has a Slimline (0°) BA




**STANDARD DIMENSIONS**

| Tool Styles Radius Set | Wire Feed Angle | Hole / Bond Flat | Hole H in / *µm* ±.0002/*5* | Bond Flat BF in / *µm* ±.0002/*5* | Foot Width W in / *µm* ±.0002/*5* | Tip Thickness T 55°/60° in / *µm* ±.0005/*13* | Useable Wire Diameter in / *µm* |
|---|---|---|---|---|---|---|---|
| UT30A US30A | 30° | 2020 | .0020 / *51* | .0020 / *51* | .0040 / *102* | .0150 / *381* | .0010 / *25* through .0013 / *33* |
| | | 2025 | .0020 / *51* | .0025 / *64* | .0040 / *102* | .0150 / *381* | |
| | | 2520 | .0025 / *64* | .0020 / *51* | .0040 / *102* | .0150 / *381* | |
| | | 2525 | .0025 / *64* | .0025 / *64* | .0040 / *102* | .0150 / *381* | |
| UT38A US38A | 38° | 3020 | .0030 / *76* | .0020 / *51* | .0050 / *127* | .0200 / *508* | .0013 / *33* through .0015 / *38* |
| | | 3025 | .0030 / *76* | .0025 / *64* | .0050 / *127* | .0200 / *508* | |
| | | 3030 | .0030 / *76* | .0030 / *76* | .0050 / *127* | .0200 / *508* | |
| | | 3035 | .0030 / *76* | .0035 / *89* | .0050 / *127* | .0200 / *508* | |
| | | 3530 | .0035 / *89* | .0030 / *76* | .0060 / *152* | .0250 / *635* | .0015 / *38* through .0022 / *55* |
| | | 3535 | .0035 / *89* | .0035 / *89* | .0060 / *152* | .0250 / *635* | |
| | | 3540 | .0035 / *89* | .0040 / *102* | .0060 / *152* | .0250 / *635* | |
| | | 4540 | .0045 / *114* | .0040 / *102* | .0085 / *216* | .0350 / *889* | .0024 / *61* through .0030 / *76* |
| | | 4545 | .0045 / *114* | .0045 / *114* | .0085 / *216* | .0350 / *889* | |
| | | 4550 | .0045 / *114* | .0050 / *127* | .0085 / *216* | .0350 / *889* | |
| UT30C US30C | 30° | 2020 | .0020 / *51* | .0020 / *51* | .0040 / *102* | .0140 / *356* | .0010 / *25* through .0013 / *33* |
| | | 2025 | .0020 / *51* | .0025 / *64* | .0040 / *102* | .0140 / *356* | |
| UT38C US38C | 38° | 2030 | .0020 / *51* | .0030 / *76* | .0040 / *102* | .0140 / *356* | |
| | | | | | | | |
| UT45A US45A | 45° | 2020 | .0020 / *51* | .0020 / *51* | .0040 / *102* | .0140 / *356* | .0010 / *25* through .0013 / *33* |
| | | 2025 | .0020 / *51* | .0025 / *64* | .0040 / *102* | .0140 / *356* | |
| | | 2520 | .0025 / *64* | .0020 / *51* | .0040 / *102* | .0140 / *356* | |
| | | 2525 | .0025 / *64* | .0025 / *64* | .0040 / *102* | .0140 / *356* | |
| | | 3020 | .0030 / *76* | .0020 / *51* | .0050 / *127* | .0180 / *457* | .0013 / *33* through .0015 / *38* |
| | | 3025 | .0030 / *76* | .0025 / *64* | .0050 / *127* | .0180 / *457* | |
| | | 3030 | .0030 / *76* | .0030 / *76* | .0050 / *127* | .0180 / *457* | |
| | | 3035 | .0030 / *76* | .0035 / *89* | .0050 / *127* | .0180 / *457* | |
| | | 3530 | .0035 / *89* | .0030 / *76* | .0060 / *152* | .0200 / *508* | .0015 / *38* through .0022 / *55* |
| | | 3535 | .0035 / *89* | .0035 / *89* | .0060 / *152* | .0200 / *508* | |
| | | 3540 | .0035 / *89* | .0040 / *102* | .0060 / *152* | .0200 / *508* | |
| | | 4540 | .0045 / *114* | .0040 / *102* | .0085 / *216* | .0250 / *635* | .0024 / *61* through .0030 / *76* |
| | | 4545 | .0045 / *114* | .0045 / *114* | .0085 / *216* | .0250 / *635* | |
| | | 4550 | .0045 / *114* | .0050 / *127* | .0085 / *216* | .0250 / *635* | |
| UT45C US45C | 45° | 2020 | .0020 / *51* | .0020 / *51* | .0040 / *102* | .0140 / *356* | .0010 / *25* through .0013 / *33* |
| | | 2025 | .0020 / *51* | .0025 / *64* | .0040 / *102* | .0140 / *356* | |
| | | 2030 | .0020 / *51* | .0030 / *76* | .0040 / *102* | .0140 / *356* | |



## US/UT SERIES - GENERAL GUIDELINES ON HOW TO ORDER

| STYLE | | FEED ANGLE |
|---|---|---|
| **US** | 0° Back Angle | 30°, 38°, 45° |
| **UT** | 10° Back Angle | |

| RADIUS SET | Wire Material | Wire Diameter | Hole Size | FR ± .0001/*3* | BR ± .0001/*3* |
|---|---|---|---|---|---|
| A | Aluminum | .0010 / *25* - .0013 / *33* | .0020/*51* - .0025/*64* | .0010 / *25* | .0010 / *25* |
| A | Aluminum | .0013 / *33* - .0015 / *38* | .0030 / *76* | .0015 / *38* | .0015 / *38* |
| A | Aluminum | .0015 / *38* - .0022 / *56* | .0035 / *89* | .0020 / *51* | .0020 / *51* |
| A | Aluminum | .0024 / *61* - .0030 / *76* | .0045 / *114* | .0025 / *64* | .0025 / *64* |
| C | Aluminum/Gold | .0008 / *20* - .0013 / *33* | .0020 / *51* | .0010 / *25* | .0006 / *15* |

| MATERIAL | | HOLE / BOND FLAT | TOOL LENGTH (TL) |
|---|---|---|---|
| **C** | Cermet composite for Gold Wire (recommended for Low Temperature bonding) | Will rely on specific application requirements (wire diameter used, bond pad size) – see dimension Table | S = .437 / *11.1 mm* |
| **M** | Microloy (Osmium-Carbide Alloy) for Gold & Aluminum Wire | * For Oval Hole options please specify HH (Hole Height) & HW (Hole Width) | ¾ = .750 / *19.05 mm* |
| **TI** | Titanium Carbide Composite for Gold Wire | | L = .828 / *21.0 mm* |
| **W** | Tungsten Carbide Ultra Fine Grain for Aluminum Wire | | 1.00 = 1.00 / *25.4 mm* |
| | | | Longer lengths are available consult Bonder manufacturer for specifications. |

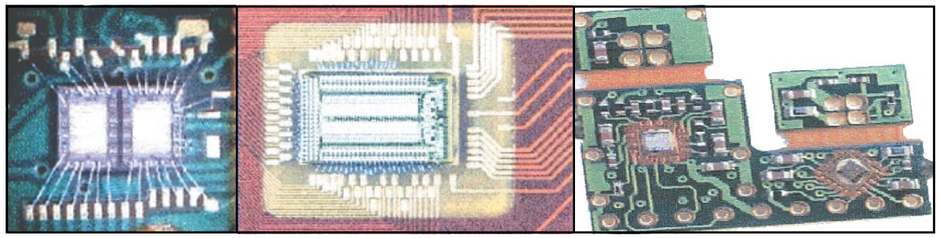
| FOOT OPTIONS | |
|---|---|
| **C** | Concave foot design with polished FR and BR with fine matte finish on BF (matte most commonly used with *Aluminum wire*) for best results specify when the BF is greater than .0015"/*38*µm. |
| **CM** | Concave foot design with FR, BR and BF matte (for *Aluminum and Gold wire*) |
| **CGM** | Cross Groove with FR and BR matte (for *Gold Wire*) with a Flat BF. Most commonly used on manual and semi automatic bonders where pad size restrictions is not an issue. |
| **CCM** | Cross Groove with FR and BR matte (for *Gold Wire*) with a Concave used on automatic bonders where wire control is critical and pad size is limited |
| Flat (Optional) | |
| **F** | The FR and BR are polished. A fine matte finish within the area of the BF. |
| **FM** | The FR, BR and BF are matte. |
| | Special foot options are available. Consult the factory for recommended dimensions for special foot options. |

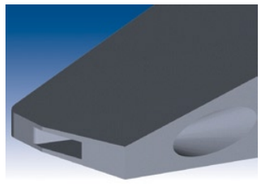
| HOW TO ORDER | |
|---|---|
| **SPECIFY** | **Style/Radius Set – Material – Hole/Bond Flat – Tool Length – Foot Option** (For modifications to standard tools, use part number and specify modified dimensions) or contact our technical support staff for assistance with your requirements. For Special Shank Style refer to page 61. |
| **EXAMPLE** | UT30A - W - 2520 - S - CM<br>US38C - TI - 2020 - ¾ - CGM<br>UT45A - W - 3030 - L - C 180 - DEG - REV (For DIAS Wire Bonder or K&S 8060)<br>US45A - C - 2025 - L - CGM |

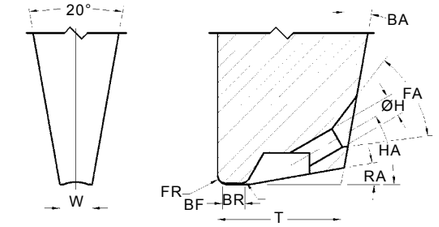
## COB SERIES - CHIP-ON-BOARD AUTOBONDING TOOL

Chip-On-Board technology is successfully used to connect semiconductors to PCBs for high integration of electronic systems or microsystems. General conditions and procedures of chip and wire bonding are highly developed for standard applications, but new materials , increasing pin numbers, complex system integration processes and demands for higher reliability in low cost throw-away assemblies and more expensive profile-critical products has led to required improvements in the material, design and life of the tool.

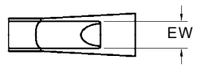
SPT has developed tools in partnership with key OEM's to meet these demands








UT has a 10° BA




| STANDARD DIMENSIONS | | | | | | | |
|---|---|---|---|---|---|---|---|
| Tool Styles | Wire Feed Angle | Hole / Bond Flat | Hole H in / *µm* ±.0002/*5* | Bond Flat BF in / *µm* ±.0002/*5* | Foot Width W in / *µm* ±.0002/*5* | Tip Thickness T in / *µm* ±.0005/*13* | Useable Wire Diameter in / *µm* |
| UT30A | 30° | 2020 | .0020 / *51* | .0020 / *51* | .0040 / *102* | .0150 / *381* | .0010 / *25* through .0013 / *33* |
| | | 2025 | .0020 / *51* | .0025 / *64* | .0040 / *102* | .0150 / *381* | |
| | | 2520 | .0025 / *64* | .0020 / *51* | .0040 / *102* | .0150 / *381* | |
| | | 2525 | .0025 / *64* | .0025 / *64* | .0040 / *102* | .0150 / *381* | |
| | | 3020 | .0030 / *76* | .0020 / *51* | .0050 / *127* | .0200 / *508* | .0013 / *33* through .0015 / *38* |
| | | 3025 | .0030 / *76* | .0025 / *64* | .0050 / *127* | .0200 / *508* | |
| | | 3030 | .0030 / *76* | .0030 / *76* | .0050 / *127* | .0200 / *508* | |
| | | 3035 | .0030 / *76* | .0035 / *89* | .0050 / *127* | .0200 / *508* | |



## COB SERIES - GENERAL GUIDELINES ON HOW TO ORDER

| STYLE | | FEED ANGLE |
|---|---|---|
| **UT** | UNIVERSAL BONDING TOOL | 30° |

| RADIUS SET | Wire Material | Wire Diameter | Hole Size | FR ± .0001/*3* | BR ± .0001/*3* |
|---|---|---|---|---|---|
| A | Aluminum | .0010 / *25* - .0013 / *33* | .0020/*51* - .0025/*64* | .0010 / *25* | .0010 / *25* |
| A | Aluminum | .0013 / *33* - .0015 / *38* | .0030 / *76* | .0015 / *38* | .0015 / *38* |

| MATERIAL | | HOLE / BOND FLAT | TOOL LENGTH (TL) |
|---|---|---|---|
| **W** | Tungsten Carbide Ultra Fine Grain for Aluminum Wire | Will rely on specific application requirements (wire diameter used, bond pad size) – see dimension Table | S = .437 / *11.1 mm*<br>¾ = .750 / *19.05 mm*<br>L = .828 / *21.0 mm*<br>1.00 = 1.00 / *25.4 mm*<br>Longer lengths are available consult Bonder manufacturer for specifications. |

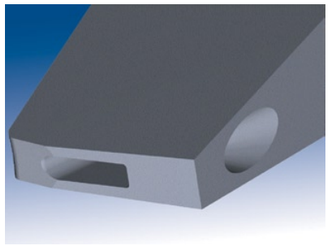
| FOOT OPTIONS | |
|---|---|
| **CM** | Concave foot design with FR, BR and BF matte (for *Aluminum and Gold wire*) |

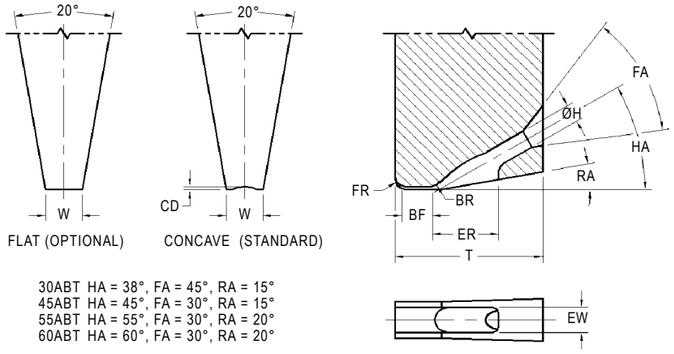
| HOW TO ORDER | |
|---|---|
| **SPECIFY** | **Style/Radius Set – Material – Hole/Bond Flat – Tool Length – Foot Option**<br>(For modifications to standard tools, use part number and specify modified dimensions) or contact our technical support staff for assistance with your requirements. For Special Shank Style refer to page 61. |
| **EXAMPLE** | UT30A - 2520 - L<br>UT30A - 2020 - ¾ |

## ABT SERIES - AUTOBONDING TOOL

The ABT design is the most widely used and recommended tool design for automatic, manual with automatic retrofit and manual ultrasonic wedge bonders due to its highly Accurate bond placement capability.

The back radius area is rounded which keeps the wire in the center of the tool. The lower back heel area of 38º produces a strong first bond transition.






30ABT HA = 38°, FA = 45°, RA = 15°
45ABT HA = 45°, FA = 30°, RA = 15°
55ABT HA = 55°, FA = 30°, RA = 20°
60ABT HA = 60°, FA = 30°, RA = 20°

**STANDARD DIMENSIONS**

| Tool Styles | Wire Feed Angle | Hole / Bond Flat | Hole H in / *µm* ±.0002/*5* | Bond Flat BF in / *µm* ±.0002/*5* | Front Radius FR in / *µm* ±.0001/*3* | Back Radius BR in / *µm* ±.0001/*3* | Foot Width W in / *µm* ±.0002/*5* | Tip Thickness T in / *µm* ±.0005/*13* | Useable Wire Diameter in / *µm* |
|---|---|---|---|---|---|---|---|---|---|
| 30ABT | 38° | 2015 | .0020 / *51* | .0015 / *38* | .0010 / *25* | .0010 / *25* | .0040 / *102* | .0140 / *356* | .0007 / *18* through .0013 / *33* |
| | | 2020 | .0020 / *51* | .0020 / *51* | .0010 / *25* | .0010 / *25* | .0040 / *102* | .0140 / *356* | |
| | | 2025 | .0020 / *51* | .0025 / *64* | .0010 / *25* | .0010 / *25* | .0040 / *102* | .0140 / *356* | |
| | | 2030 | .0020 / *51* | .0030 / *76* | .0010 / *25* | .0010 / *25* | .0040 / *102* | .0140 / *356* | |
| 45ABT | 45° | 2520 | .0025 / *64* | .0020 / *51* | .0010 / *25* | .0010 / *25* | .0040 / *102* | .0140 / *356* | .0010 / *25* through .0015 / *38* |
| | | 2525 | .0025 / *64* | .0025 / *64* | .0010 / *25* | .0010 / *25* | .0040 / *102* | .0140 / *356* | |
| | | 2530 | .0025 / *64* | .0030 / *76* | .0010 / *25* | .0010 / *25* | .0040 / *102* | .0140 / *356* | |
| | | 2535 | .0025 / *64* | .0035 / *89* | .0010 / *25* | .0010 / *25* | .0040 / *102* | .0150 / *381* | |
| | | 2540 | .0025 / *64* | .0040 / *102* | .0010 / *25* | .0010 / *25* | .0040 / *102* | .0150 / *381* | |
| 30ABT | 38° | 3020 | .0030 / *76* | .0020 / *51* | .0010 / *25* | .0010 / *25* | .0050 / *127* | .020 / *508* | .0015 / *38* through .0020 / *51* |
| | | 3025 | .0030 / *76* | .0025 / *64* | .0010 / *25* | .0010 / *25* | .0050 / *127* | .020 / *508* | |
| | | 3030 | .0030 / *76* | .0030 / *76* | .0010 / *25* | .0010 / *25* | .0050 / *127* | .020 / *508* | |
| | | 3035 | .0030 / *76* | .0035 / *89* | .0010 / *25* | .0010 / *25* | .0050 / *127* | .020 / *508* | |
| | | 3040 | .0030 / *76* | .0040 / *102* | .0010 / *25* | .0010 / *25* | .0050 / *127* | .020 / *508* | |
| 45ABT | 45° | 3020 | .0030 / *76* | .0020 / *51* | .0010 / *25* | .0010 / *25* | .0050 / *127* | .0180 / *457* | |
| 55ABT | 55° | 3025 | .0030 / *76* | .0025 / *64* | .0010 / *25* | .0010 / *25* | .0050 / *127* | .0180 / *457* | |
| 60ABT | 60° | 3030 | .0030 / *76* | .0030 / *76* | .0010 / *25* | .0010 / *25* | .0050 / *127* | .0180 / *457* | |
| | | 3035 | .0030 / *76* | .0035 / *89* | .0010 / *25* | .0010 / *25* | .0050 / *127* | .0180 / *457* | |
| | | 3040 | .0030 / *76* | .0040 / *102* | .0010 / *25* | .0010 / *25* | .0050 / *127* | .0180 / *457* | |



## ABT SERIES - GENERAL GUIDELINES ON HOW TO ORDER

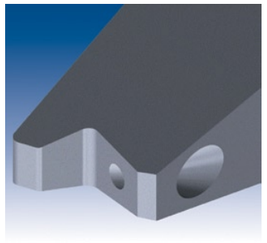
| STYLE | | FEED ANGLE |
|---|---|---|
| **ABT** | AUTO BONDING TOOL | 38°, 45°, 55°, 60° |

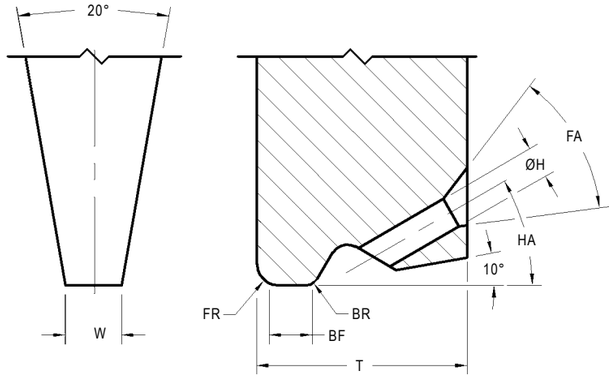
| MATERIAL | | HOLE / BOND FLAT | TOOL LENGTH (TL) |
|---|---|---|---|
| **C** | Cermet composite for Gold Wire (recommended for Low Temperature bonding) | Will rely on specific application requirements (wire diameter used, bond pad size) – see dimension Table<br>* For Oval Hole options please specify HH (Hole Height) & HW (Hole Width) | S = .437 / *11.1 mm*<br>¾ = .750 / *19.05 mm*<br>L = .828 / *21.0 mm*<br>1.00 = 1.00 / *25.4 mm*<br>Longer lengths are available consult Bonder manufacturer for specifications. |
| **M** | Microloy (Osmium-Carbide Alloy) for Gold & Aluminum Wire | | |
| **TI** | Titanium Carbide Composite for Gold Wire | | |
| **W** | Tungsten Carbide Ultra Fine Grain for Aluminum Wire | | |

| FOOT OPTIONS | |
|---|---|
| **C** | Concave foot design with polished FR and BR with matte finish on BF (matte most commonly used with *Aluminum wire*) for best results specify when the BF is greater than .0015”/*38*µm. |
| **CM** | Concave foot design with FR, BR and BF matte (for *Aluminum and Gold wire*) |
| Flat (Optional) | |
| **F** | The FR and BR are polished. A fine matte finish is within the area of the BF. |
| **FM** | The FR, BR and BF are matte. |
| **CGM** | Cross Groove with FR and BR matte (for *Gold Wire*) with a matte Flat BF. Most commonly used on manual and semi automatic bonders where pad size restrictions is not an issue. Not recommended for BFsmaller than .0020”/50µm |
| **CCM** | Cross Groove with FR and BR matte (for *Gold Wire*) with a Concave used on automatic bonders where wire control is critical and pad size is limited. Not recommended for BFsmaller than .0020”/50µm |

| HOW TO ORDER | |
|---|---|
| **SPECIFY** | **Style – Material – Hole/Bond Flat – Tool Length – Foot Option**<br>(For modifications to standard tools, use part number and specify modified dimensions) or contact our technical support staff for assistance with your requirements. For Special Shank Style refer to page 61. |
| **EXAMPLE** | 30ABT - W - 2520 - L - CM 180 - DEG - REV (For DIAS Wire Bonder or K&S 8060)<br>45ABT - TI - 2020 - ¾ - CGM |

Microwave devices commonly have bonding pads as small as .001”/ 25µm square. They are typically bonded with .0005”/13µm to .001”/25µm diameter gold wires. Microwave devices have some special requirements that are not seen in monolithic devices special requirements include the variety of chips within the package, step heights within the products that require deep access requirements, as well as critical loop shapes for tuning of the device. We have developed a range of tools to meet the small foot print, and critical loop requirements.






| | |
|---|---|
| M30 | HA = 30°, FA = 45° |
| M38 | HA = 38°, FA = 45° |
| M45 | HA = 45°, FA = 45° |
| M55 | HA = 55°, FA = 30° |
| M60 | HA = 60°, FA = 30° |

**STANDARD DIMENSIONS**

| Tool Styles | Hole / Bond Flat | Hole H in / *µm* ±.0002/*5* | Bond Flat BF in / *µm* ±.0001/*3* | Front Radius FR in / *µm* ±.0001/*3* | Back Radius BR in / *µm* ±.0001/*3* | Foot Width W in / *µm* ±.0002/*5* | Tip Thickness T 30° in / *µm* ±.0005/*13* | Tip Thickness T 45° in / *µm* ±.0005/*13* | Tip Thickness T 55°/60° in / *µm* ±.0005/*13* | Useable Wire Diameter in / *µm* |
|---|---|---|---|---|---|---|---|---|---|---|
| M30A | 1005 | .0010 / *25* | .0005 / *13* | .0010 / *25* | .0006 / *15* | .0030 / *76* | .0100 / *254* | .0080 / *203* | .0080 / *203* | .0005 / *13* through .0010 / *25* |
| | 1007 | .0010 / *25* | .0007 / *18* | .0010 / *25* | .0006 / *15* | .0030 / *76* | .0100 / *254* | .0080 / *203* | .0080 / *203* | |
| | 1010 | .0010 / *25* | .0010 / *25* | .0010 / *25* | .0006 / *15* | .0030 / *76* | .0100 / *254* | .0080 / *203* | .0080 / *203* | |
| M38A | 1505 | .0015 / *38* | .0005 / *13* | .0010 / *25* | .0006 / *15* | .0030 / *76* | .0100 / *254* | .0080 / *203* | .0080 / *203* | |
| | 1507 | .0015 / *38* | .0007 / *18* | .0010 / *25* | .0006 / *15* | .0030 / *76* | .0100 / *254* | .0080 / *203* | .0080 / *203* | |
| | 1510 | .0015 / *38* | .0010 / *25* | .0010 / *25* | .0006 / *15* | .0030 / *76* | .0100 / *254* | .0080 / *203* | .0080 / *203* | |
| | 1513 | .0015 / *38* | .0013 / *33* | .0010 / *25* | .0006 / *15* | .0030 / *76* | .0100 / *254* | .0080 / *203* | .0080 / *203* | |
| M45A | 1515 | .0015 / *38* | .0015 / *38* | .0010 / *25* | .0006 / *15* | .0030 / *76* | .0100 / *254* | .0080 / *203* | .0080 / *203* | |
| | 1520 | .0015 / *38* | .0020 / *51* | .0010 / *25* | .0006 / *15* | .0030 / *76* | .0100 / *254* | .0080 / *203* | .0080 / *203* | |
| M55A | 2005 | .0200 / *51* | .0005 / *13* | .0010 / *25* | .0006 / *15* | .0040 / *102* | .0100 / *254* | .0080 / *203* | .0080 / *203* | |
| | 2007 | .0200 / *51* | .0007 / *18* | .0010 / *25* | .0006 / *15* | .0040 / *102* | .0100 / *254* | .0080 / *203* | .0080 / *203* | |
| | 2010 | .0200 / *51* | .0010 / *25* | .0010 / *25* | .0006 / *15* | .0040 / *102* | .0100 / *254* | .0080 / *203* | .0080 / *203* | |
| M60A | 2013 | .0200 / *51* | .0013 / *33* | .0010 / *25* | .0006 / *15* | .0040 / *102* | .0120 / *305* | .0100 / *254* | .0090 / *229* | |
| | 2015 | .0200 / *51* | .0015 / *38* | .0010 / *25* | .0006 / *15* | .0040 / *102* | .0120 / *305* | .0100 / *254* | .0090 / *229* | |
| | 2020 | .0200 / *51* | .0020 / *51* | .0010 / *25* | .0006 / *15* | .0040 / *102* | .0120 / *305* | .0100 / *254* | .0090 / *229* | |
| M30B | 1005 | .0010 / *25* | .0005 / *13* | .0004 / *10* | .0004 / *10* | .0030 / *76* | .0080 / *203* | .0080 / *203* | .0080 / *203* | .0005 / *13* through .0010 / *25* |
| | 1007 | .0010 / *25* | .0007 / *18* | .0004 / *10* | .0004 / *10* | .0030 / *76* | .0080 / *203* | .0080 / *203* | .0080 / *203* | |
| | 1010 | .0010 / *25* | .0010 / *25* | .0004 / *10* | .0004 / *10* | .0030 / *76* | .0080 / *203* | .0080 / *203* | .0080 / *203* | |
| M38B | 1505 | .0015 / *38* | .0005 / *13* | .0004 / *10* | .0004 / *10* | .0030 / *76* | .0080 / *203* | .0080 / *203* | .0080 / *203* | |
| | 1507 | .0015 / *38* | .0007 / *18* | .0004 / *10* | .0004 / *10* | .0030 / *76* | .0080 / *203* | .0080 / *203* | .0080 / *203* | |
| | 1510 | .0015 / *38* | .0010 / *25* | .0004 / *10* | .0004 / *10* | .0030 / *76* | .0080 / *203* | .0080 / *203* | .0080 / *203* | |
| | 1513 | .0015 / *38* | .0013 / *33* | .0004 / *10* | .0004 / *10* | .0030 / *76* | .0100 / *254* | .0080 / *203* | .0080 / *203* | |
| M45B | 1515 | .0015 / *38* | .0015 / *38* | .0004 / *10* | .0004 / *10* | .0030 / *76* | .0100 / *254* | .0080 / *203* | .0080 / *203* | |
| | 1520 | .0015 / *38* | .0020 / *51* | .0004 / *10* | .0004 / *10* | .0030 / *76* | .0100 / *254* | .0080 / *203* | .0080 / *203* | |
| M55B | 2005 | .0020 / *51* | .0005 / *13* | .0004 / *10* | .0004 / *10* | .0040 / *102* | .0100 / *254* | .0080 / *203* | .0080 / *203* | |
| | 2007 | .0020 / *51* | .0007 / *18* | .0004 / *10* | .0004 / *10* | .0040 / *102* | .0100 / *254* | .0080 / *203* | .0080 / *203* | |
| | 2010 | .0020 / *51* | .0010 / *25* | .0004 / *10* | .0004 / *10* | .0040 / *102* | .0100 / *254* | .0080 / *203* | .0080 / *203* | |
| M60B | 2013 | .0020 / *51* | .0013 / *33* | .0004 / *10* | .0004 / *10* | .0040 / *102* | .0120 / *305* | .0080 / *203* | .0080 / *203* | |
| | 2015 | .0020 / *51* | .0015 / *38* | .0004 / *10* | .0004 / *10* | .0040 / *102* | .0120 / *305* | .0080 / *203* | .0080 / *203* | |
| | 2020 | .0020 / *51* | .0020 / *51* | .0004 / *10* | .0004 / *10* | .0040 / *102* | .0120 / *305* | .0080 / *203* | .0080 / *203* | |

“W dimension .002 to .0025 only for hole size .001 to .0015 ”

Refer to page 17 for “How To Order”





| STYLE | | FEED ANGLE |
|---|---|---|
| **M** = MICROWAVE | SLIMLINE BACK | 30°, 38°, 45°,55°, 60° |

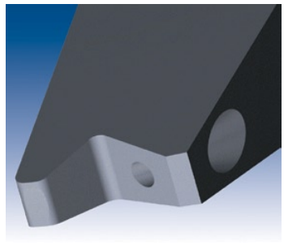
| MATERIAL | | HOLE / BOND FLAT | TOOL LENGTH (TL) |
|---|---|---|---|
| **C** | Cermet composite for Gold Wire (recommended for Low Temperature bonding) | Will rely on specific application requirements (wire diameter used, bond pad size) – see dimension Table<br>* For Oval Hole options please specify HH (Hole Height) & HW (Hole Width) | S = .437 / *11.1 mm*<br>¾ = .750 / *19.05 mm*<br>L = .828 / *21.0 mm*<br>1.00 = 1.00 / *25.4 mm*<br>Longer lengths are available consult Bonder manufacturer for specifications. |
| **M** | Microloy (Osmium-Carbide Alloy) for Gold & Aluminum Wire | | |
| **TI** | Titanium Carbide Composite for Gold Wire | | |
| **W** | Tungsten Carbide Ultra Fine Grain for Aluminum Wire | | |

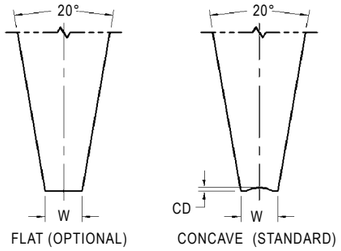
| FOOT OPTIONS | |
|---|---|
| **FM** | Flat foot design FR, BR and BF are matte (for *Gold Wire*) |
| **CGM** | The FR and BR and BF are matte. Not recommended for BFsmaller than .0020”/50µm |

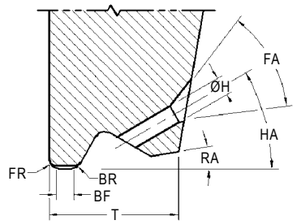
| HOW TO ORDER | |
|---|---|
| **SPECIFY** | **Style – Material – Hole/Bond Flat – Tool Length – Foot Option**<br>(For modifications to standard tools, use part number and specify modified dimensions) or contact our technical support staff for assistance with your requirements. For Special Shank Style refer to page 61. |
| **EXAMPLE** | M30A –TI –1507 –L - FM<br>M45B –TI –2020 –L - FM<br>M55A –TI –1513 –L – FM |

## STANDARD NOTCH BONDING TOOL SERIES

The standard 10º back bonding wedge is designed for use with aluminum wire in all conventional manual bonding machines. The notched tip minimizes wire drag during the looping formation preventing heel cracks and broken wires.






1001 HA = 30°, FA = 45°, RA = 15°
1002 HA = 45°, FA = 45°, RA = 15°
1110 HA = 60°, FA = 30°, RA = 20°

**STANDARD DIMENSIONS**

| Tool Styles | Hole / Bond Flat | Hole H in / µm ±.0002/5 | Bond Flat BF in / µm ±.0002/5 | Front Radius FR in / µm ±.0001/3 | Back Radius BR in / µm ±.0001/3 | Foot Width W 1001, 1002 in / µm ±.0002/5 | Foot Width W 1110 in / µm ±.0002/5 | Tip Thickness T 1001 in / µm ±.0005/13 | Tip Thickness T 1002 in / µm ±.0005/13 | Tip Thickness T 1110 in / µm ±.0005/13 | Useable Wire Diameter in / µm |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1001A 1002A 1110A | 2020 | .0020 / 51 | .0020 / 51 | .0010 / 25 | .0010 / 25 | .0040 / 102 | .0065 / 165 | .0150 / 381 | .0140 / 356 | .0120 / 305 | .0007 / 18 through .0013 / 33 |
| | 2025 | .0020 / 51 | .0025 / 64 | .0010 / 25 | .0010 / 25 | .0040 / 102 | .0065 / 165 | .0150 / 381 | .0140 / 356 | .0120 / 305 | |
| | 2030 | .0020 / 51 | .0030 / 76 | .0010 / 25 | .0010 / 25 | .0040 / 102 | .0065 / 165 | .0150 / 381 | .0140 / 356 | .0140 / 356 | |
| | 2515 | .0025 / 64 | .0015 / 38 | .0010 / 25 | .0010 / 25 | .0040 / 102 | .0065 / 165 | .0150 / 381 | .0140 / 356 | .0120 / 305 | .0010 / 25 through .0015 / 38 |
| | 2520 | .0025 / 64 | .0020 / 51 | .0010 / 25 | .0010 / 25 | .0040 / 102 | .0065 / 165 | .0150 / 381 | .0140 / 356 | .0120 / 305 | |
| | 2525 | .0025 / 64 | .0025 / 64 | .0010 / 25 | .0010 / 25 | .0040 / 102 | .0065 / 165 | .0150 / 381 | .0140 / 356 | .0120 / 305 | |
| | 2530 | .0025 / 64 | .0030 / 76 | .0010 / 25 | .0010 / 25 | .0040 / 102 | .0065 / 165 | .0150 / 381 | .0140 / 356 | .0140 / 356 | |
| | 2535 | .0025 / 64 | .0035 / 89 | .0015 / 38 | .0010 / 25 | .0050 / 127 | .0065 / 165 | .0180 / 457 | .0150 / 381 | .0140 / 356 | |
| | 2540 | .0025 / 64 | .0040 / 102 | .0015 / 38 | .0010 / 25 | .0050 / 127 | .0065 / 165 | .0180 / 457 | .0150 / 381 | .0140 / 356 | |
| | 3020 | .0030 / 76 | .0020 / 51 | .0015 / 38 | .0015 / 38 | .0050 / 127 | .0065 / 165 | .0200 / 508 | .0180 / 457 | .0180 / 457 | .0015 / 38 through .0017 / 40 |
| | 3025 | .0030 / 76 | .0025 / 64 | .0015 / 38 | .0015 / 38 | .0050 / 127 | .0065 / 165 | .0200 / 508 | .0180 / 457 | .0180 / 457 | |
| | 3030 | .0030 / 76 | .0030 / 76 | .0015 / 38 | .0015 / 38 | .0050 / 127 | .0065 / 165 | .0200 / 508 | .0180 / 457 | .0180 / 457 | |
| | 3035 | .0030 / 76 | .0035 / 89 | .0015 / 38 | .0015 / 38 | .0050 / 127 | .0065 / 165 | .0200 / 508 | .0180 / 457 | .0180 / 457 | |
| | 3040 | .0030 / 76 | .0040 / 102 | .0015 / 38 | .0015 / 38 | .0050 / 127 | .0065 / 165 | .0200 / 508 | .0180 / 457 | .0180 / 457 | |
| 1001B 1002B 1110B | 2020 | .0020 / 51 | .0020 / 51 | .0015 / 38 | .0010 / 25 | .0040 / 102 | .0065 / 165 | .0150 / 381 | .0140 / 356 | .0120 / 305 | .0007 / 18 through .0013 / 33 |
| | 2025 | .0020 / 51 | .0025 / 64 | .0015 / 38 | .0010 / 25 | .0040 / 102 | .0065 / 165 | .0150 / 381 | .0140 / 356 | .0140 / 356 | |
| | 2030 | .0020 / 51 | .0030 / 76 | .0015 / 38 | .0010 / 25 | .0040 / 102 | .0065 / 165 | .0150 / 381 | .0140 / 356 | .0140 / 356 | |
| | 2515 | .0025 / 64 | .0015 / 38 | .0015 / 38 | .0010 / 25 | .0040 / 102 | .0065 / 165 | .0150 / 381 | .0140 / 356 | .0120 / 305 | .0010 / 25 through .0015 / 38 |
| | 2520 | .0025 / 64 | .0020 / 51 | .0015 / 38 | .0010 / 25 | .0040 / 102 | .0065 / 165 | .0150 / 381 | .0140 / 356 | .0120 / 305 | |
| | 2525 | .0025 / 64 | .0025 / 64 | .0015 / 38 | .0010 / 25 | .0050 / 127 | .0065 / 165 | .0150 / 381 | .0140 / 356 | .0140 / 356 | |
| | 2530 | .0025 / 64 | .0030 / 76 | .0015 / 38 | .0010 / 25 | .0050 / 127 | .0065 / 165 | .0200 / 508 | .0140 / 356 | .0140 / 356 | |



## STANDARD NOTCH BONDING TOOLS - GENERAL GUIDELINES ON HOW TO ORDER

| STYLE | | FEED ANGLE |
|---|---|---|
| **1001** | STANDARD 10° BACK | 30° |
| **1002** | | 45° |
| **1110** | | 60° |

| MATERIAL | | HOLE / BOND FLAT | TOOL LENGTH (TL) |
|---|---|---|---|
| **C** | Cermet composite for Gold Wire (recommended for Low Temperature bonding) | Will rely on specific application requirements (wire diameter used, bond pad size) – see dimension Table | S = .437 / *11.1 mm* |
| **M** | Microloy (Osmium-Carbide Alloy) for Gold & Aluminum Wire | * For Oval Hole options please specify HH (Hole Height) & HW (Hole Width) | ¾ = .750 / *19.05 mm* |
| **TI** | Titanium Carbide Composite for Gold Wire | | L = .828 / *21.0 mm* |
| **W** | Tungsten Carbide Ultra Fine Grain for Aluminum Wire | | 1.00 = 1.00 / *25.4 mm* |
| | | | Longer lengths are available consult Bonder manufacturer for specifications. |

**FOOT OPTIONS**

Concave (Standard)

The Concave Depth (CD) is typically 10 to 15% of the usable wire diameter. There are small side flats on the edges to reduce edge chipping and minimize tool marks on the bond pad if the wire is missing.

| | |
|---|---|
| **C** | The FR and BR are polished. A fine matte finish within the area of the BF (Most Commonly Specified) |
| **CM** | The FR,BR and BF are matte. |
| **CGM** | Cross Groove foot design with FR, BR, and BF matte (for *Gold Wire*). Not recommended for BFsmaller than .0020”/50µm |

Flat (Optional)

| | |
|---|---|
| **F** | The FR and BR are polished. A fine matte finish within the area of the BF. |
| **FM** | The FR, BR and BF are matte. |

Special foot options are available. Consult the factory for recommended dimensions for special foot options.

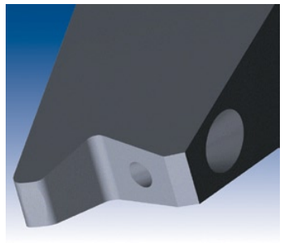
**HOW TO ORDER**

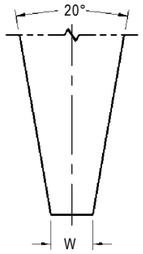
| | |
|---|---|
| **SPECIFY** | **Style – Material – Hole/Bond Flat – Tool Length – Foot Option** (For modifications to standard tools, use part number and specify modified dimensions) or contact our technical support staff for assistance with your requirements. For Special Shank Style refer to page 61. |
| **EXAMPLE** | 1001A-W-2525-L-C<br>1001B-W-2530-S-C |

## SLIMLINE NOTCH SERIES - BONDING TOOLS

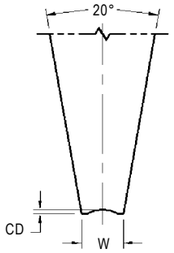
The 0º back bonding wedge is designed for use with aluminum wire in all conventioinal bonding machines. The 0º back angle is designed to solve problems of package wall height clearance around the lead.

The notched tip minimizes wire drag during the looping formation preventing heel cracks and broken wires.

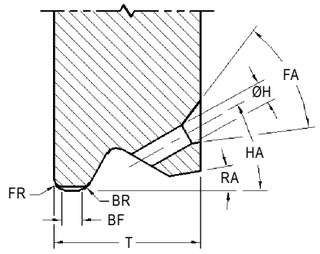





FLAT (OPTIONAL)




CONCAVE (STANDARD)




| | |
|---|---|
| 1200 | HA = 30°, FA = 45°, RA = 15° |
| 1300 | HA = 45°, FA = 45°, RA = 15° |
| 1400 | HA = 55°, FA = 30°, RA = 20° |
| 1100 | HA = 60°, FA = 30°, RA = 20° |

**STANDARD DIMENSIONS**

| Tool Styles | Hole / Bond Flat | Hole H in / µm ±.0002/5 | Bond Flat BF in / µm ±.0002/5 | Front Radius FR in / µm ±.0001/3 | Back Radius BR in / µm ±.0001/3 | Foot Width W 1200, 1300 in / µm ±.0002/5 | Foot Width W 1400 / 1100 in / µm ±.0002/5 | Tip Thickness T 1200 in / µm ±.0005/13 | Tip Thickness T 1300 in / µm ±.0005/13 | Tip Thickness T 1400 / 1100 in / µm ±.0005/13 | Useable Wire Diameter in / µm |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1200A 1300A 1400A 1100A | 2025 | .0020 / 51 | .0025 / 64 | .0010 / 25 | .0010 / 25 | .0040 / 102 | .0065 / 165 | .0150 / 381 | .0140 / 356 | .0120 / 305 | .0007 / 18 through .0013 / 33 |
| | 2030 | .0020 / 51 | .0030 / 76 | .0010 / 25 | .0010 / 25 | .0040 / 102 | .0065 / 165 | .0150 / 381 | .0140 / 356 | .0140 / 356 | |
| | 2520 | .0025 / 64 | .0020 / 51 | .0010 / 25 | .0010 / 25 | .0040 / 102 | .0065 / 165 | .0150 / 381 | .0140 / 356 | .0120 / 305 | .0010 / 25 through .0013 / 33 |
| | 2525 | .0025 / 64 | .0025 / 64 | .0010 / 25 | .0010 / 25 | .0040 / 102 | .0065 / 165 | .0150 / 381 | .0140 / 356 | .0120 / 305 | |
| | 2530 | .0025 / 64 | .0030 / 76 | .0010 / 25 | .0010 / 25 | .0040 / 102 | .0065 / 165 | .0150 / 381 | .0140 / 356 | .0140 / 356 | |
| | 2535 | .0025 / 64 | .0035 / 89 | .0015 / 38 | .0010 / 25 | .0050 / 127 | .0065 / 165 | .0180 / 457 | .0150 / 381 | .0140 / 356 | |
| | 2540 | .0025 / 64 | .0040 / 102 | .0015 / 38 | .0010 / 25 | .0050 / 127 | .0065 / 165 | .0180 / 457 | .0150 / 381 | .0140 / 356 | |
| | 3020 | .0030 / 76 | .0020 / 51 | .0015 / 38 | .0015 / 38 | .0050 / 127 | .0065 / 165 | .0200 / 508 | .0180 / 457 | .0180 / 457 | .0015 / 38 through .0017 / 40 |
| | 3025 | .0030 / 76 | .0025 / 64 | .0015 / 38 | .0015 / 38 | .0050 / 127 | .0065 / 165 | .0200 / 508 | .0180 / 457 | .0180 / 457 | |
| | 3030 | .0030 / 76 | .0030 / 76 | .0015 / 38 | .0015 / 38 | .0050 / 127 | .0065 / 165 | .0200 / 508 | .0180 / 457 | .0180 / 457 | |
| | 3035 | .0030 / 76 | .0035 / 89 | .0015 / 38 | .0015 / 38 | .0050 / 127 | .0065 / 165 | .0200 / 508 | .0180 / 457 | .0180 / 457 | |
| | 3040 | .0030 / 76 | .0040 / 102 | .0015 / 38 | .0015 / 38 | .0050 / 127 | .0065 / 165 | .0200 / 508 | .0180 / 457 | .0180 / 457 | |
| | 3530 | .0035 / 89 | .0030 / 76 | .0020 / 51 | .0020 / 51 | .0060 / 152 | .0065 / 165 | .0250 / 635 | .0220 / 559 | .0210 / 533 | .0017 / 40 through .0022 / 55 |
| | 3535 | .0035 / 89 | .0035 / 89 | .0020 / 51 | .0020 / 51 | .0060 / 152 | .0065 / 165 | .0250 / 635 | .0220 / 559 | .0210 / 533 | |
| | 3540 | .0035 / 89 | .0040 / 102 | .0020 / 51 | .0020 / 51 | .0060 / 152 | .0065 / 165 | .0250 / 635 | .0220 / 559 | .0210 / 533 | |
| | 3545 | .0035 / 89 | .0045 / 114 | .0020 / 51 | .0020 / 51 | .0060 / 152 | .0065 / 165 | .0250 / 635 | .0220 / 559 | .0210 / 533 | |
| | 3550 | .0035 / 89 | .0050 / 127 | .0020 / 51 | .0020 / 51 | .0060 / 152 | .0065 / 165 | .0250 / 635 | .0220 / 559 | .0210 / 533 | |
| 1200B 1300B | 2025 | .0020 / 51 | .0025 / 64 | .0015 / 38 | .0010 / 25 | .0040 / 102 | .0065 / 165 | .0150 / 381 | .0140 / 356 | .0140 / 356 | .0007 / 18 through .0013 / 33 |
| | 2030 | .0020 / 51 | .0030 / 76 | .0015 / 38 | .0010 / 25 | .0040 / 102 | .0065 / 165 | .0150 / 381 | .0140 / 356 | .0140 / 356 | |
| 1400B 1100B | 2520 | .0025 / 64 | .0020 / 51 | .0015 / 38 | .0010 / 25 | .0040 / 102 | .0065 / 165 | .0150 / 381 | .0140 / 356 | .0120 / 305 | .0010 / 25 through .0013 / 33 |
| | 2525 | .0025 / 64 | .0025 / 64 | .0015 / 38 | .0010 / 25 | .0050 / 127 | .0065 / 165 | .0150 / 381 | .0140 / 356 | .0140 / 356 | |
| | 2530 | .0025 / 64 | .0030 / 76 | .0015 / 38 | .0010 / 25 | .0050 / 127 | .0065 / 165 | .0200 / 508 | .0140 / 356 | .0140 / 356 | |

- For wire diameters .0010”/25µm or less consider the Microwave Bonding Tools
- Microwave Style Tool is recommended for Hole = .0020” and BF = 0020” and below.



## SLIMLINE NOTCH SERIES - GENERAL GUIDELINES ON HOW TO ORDER

| STYLE | | FEED ANGLE |
|---|---|---|
| 1200 | SLIMLINE BACK | 30° |
| 1300 | | 45° |
| 1400 | | 55° |
| 1100 | | 60° |

| MATERIAL | | HOLE / BOND FLAT | TOOL LENGTH (TL) |
|---|---|---|---|
| C | Cermet composite for Gold Wire (recommended for Low Temperature bonding) | Will rely on specific application requirements (wire diameter used, bond pad size) – see dimension Table<br>* For Oval Hole options please specify HH (Hole Height) & HW (Hole Width) | S = .437 / *11.1 mm*<br>¾ = .750 / *19.05 mm*<br>L = .828 / *21.0 mm*<br>1.00 = 1.00 / *25.4 mm*<br>Longer lengths are available consult Bonder manufacturer for specifications. |
| M | Microloy (Osmium-Carbide Alloy) for Gold & Aluminum Wire | | |
| TI | Titanium Carbide Composite for Gold Wire | | |
| W | Tungsten Carbide Ultra Fine Grain for Aluminum Wire | | |

**FOOT OPTIONS**

Concave (Standard)

The Concave Depth (CD) is typically 10 to 15% of the usable wire diameter. There are small side flats on the edges to reduce edge chipping and minimize tool marks on the bond pad if the wire is missing.

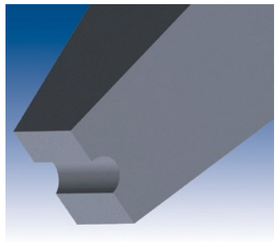
| | |
|---|---|
| C | The FR and BR are polished. A fine matte finish within the area of the BF (Most Commonly Specified) |
| CM | The FR,BR and BF are matte. |

Flat (Optional)

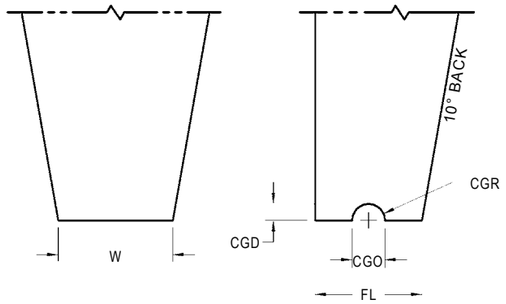
| | |
|---|---|
| F | The FR and BR are polished. A fine matte finish within the area of the BF (Most Commonly Specified) |
| FM | The FR,BR and BF are matte. |
| | Special foot options are available. Consult the factory for recommended dimensions for special foot options. |
| CG | The FR and BR are polished. A fine matte finish is within the area of the BF. Not recommended for BFsmaller than .0020”/50µm |
| CGM | The FR and BR and BF are matte. Not recommended for BFsmaller than .0020”/50µm |

**HOW TO ORDER**

| | |
|---|---|
| SPECIFY | **Style – Material – Hole/Bond Flat – Tool Length – Foot Option**<br>(For modifications to standard tools, use part number and specify modified dimensions) or contact our technical support staff for assistance with your requirements. For Special Shank Style refer to page 61. |
| EXAMPLE | 1200A-W-2525-L-C<br>1200B-W-2530-S-C<br>1300A-W-2020-3/4-FM<br>1110A-W-2025-S-C |



**1008A SIDE WIRE BONDING WEDGE**




| STANDARD DIMENSIONS | | | | | |
|---|---|---|---|---|---|
| Tool Styles | Foot Length FL in / *µm* ±.0002/5 | Foot Width W in / *µm* ±.0002/5 | Cross Groove Depth CGD in / *µm* ±.0001/3 | Cross Groove Radius CGR in / *µm* ±.0001/3 | Useable Wire Diameter WD in / *µm* (Ref) |
| 1008A | .0030 / *76* | .0020 / *51* to .0040 / *102* | .0005 / *13* | .0005 / *13* | .0010 / *25* |
| 1008A | .0035 / *89* | .0020 / *51* to .0040 / *102* | .0005 / *13* | .0005 / *13* | .0010 / *25* |
| 1008A | .0040 / *102* | .0020 / *51* to .0040 / *102* | .0005 / *13* | .0005 / *13* | .0010 / *25* |
| 1008A | .0045 / *114* | .0020 / *51* to .0040 / *102* | .0005 / *13* | .0005 / *13* | .0010 / *25* |
| 1008A | .0050 / *127* | .0020 / *51* to .0040 / *102* | .0005 / *13* | .0005 / *13* | .0010 / *25* |
| 1008A | .0060 / *152* | .0020 / *51* to .0040 / *102* | .0005 / *13* | .0005 / *13* | .0010 / *25* |
| 1008A | .0045 / *114* | .0030 / *76* to .0050 / *127* | .0008 / *19* | .0008 / *19* | .0015 / *38* |
| 1008A | .0050 / *127* | .0030 / *76* to .0050 / *127* | .0008 / *19* | .0008 / *19* | .0015 / *38* |
| 1008A | .0060 / *152* | .0030 / *76* to .0050 / *127* | .0008 / *19* | .0008 / *19* | .0015 / *38* |
| 1008A | .0070 / *178* | .0030 / *76* to .0050 / *127* | .0008 / *19* | .0008 / *19* | .0015 / *38* |
| 1008A | .0080 / *203* | .0030 / *76* to .0050 / *127* | .0008 / *19* | .0008 / *19* | .0015 / *38* |
| 1008A | .0060 / *152* | .0040 / *102* to .0060 / *152* | .0010 / *25* | .0010 / *25* | .0020 / *51* |
| 1008A | .0070 / *178* | .0040 / *102* to .0060 / *152* | .0010 / *25* | .0010 / *25* | .0020 / *51* |
| 1008A | .0080 / *203* | .0040 / *102* to .0060 / *152* | .0010 / *25* | .0010 / *25* | .0020 / *51* |
| 1008A | .0090 / *229* | .0040 / *102* to .0060 / *152* | .0010 / *25* | .0010 / *25* | .0020 / *51* |
| 1008A | .0100 / *254* | .0040 / *102* to .0060 / *152* | .0010 / *25* | .0010 / *25* | .0020 / *51* |





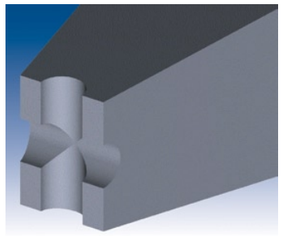


| STYLE | |
|---|---|
| **1008A** | SIDE WIRE BONDING WEDGE<br>STANDARD 10° BACK |

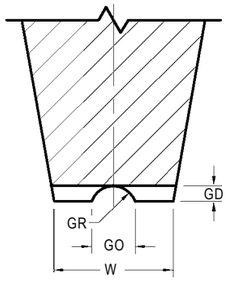
| MATERIAL | | FOOT LENGTH | TOOL LENGTH (TL) |
|---|---|---|---|
| **C** | Cermet composite for Gold Wire (recommended for Low Temperature bonding) | Will rely on specific application requirements (wire diameter used, bond pad size) – see dimension Table | S = .437 / *11.1 mm*<br>¾ = .750 / *19.05 mm*<br>L = .828 / *21.0 mm*<br>1.00 = 1.00 / *25.4 mm*<br>Longer lengths are available consult Bonder manufacturer for specifications. |
| **M** | Microloy (Osmium-Carbide Alloy) for Gold & Aluminum Wire | | |
| **TI** | Titanium Carbide Composite for Gold Wire | | |
| **W** | Tungsten Carbide Ultra Fine Grain for Aluminum Wire | | |

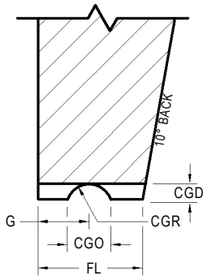
| FOOT OPTIONS | |
|---|---|
| **M** | Matte finish on tip |

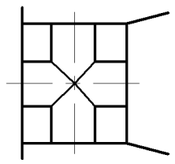
| HOW TO ORDER | |
|---|---|
| **SPECIFY** | **Style – Material – Tool Diameter – Tool Length – Foot Design**<br>(Specify FL, W, CGD and CGR dimensions).<br>For Special Shank Style refer to page 61. |
| **EXAMPLE** | 1008A-W-1/16-L-M<br>FL=.003, W = .004, CGD = CGR = .0005 |



**XGR INSULATED WIRE BONDING WEDGE**



| STANDARD DIMENSIONS | | | | | | |
|---|---|---|---|---|---|---|
| Tool Styles | Foot Length FL in / *µm* ±.0002/*5* | Foot Width W in / *µm* ±.0002/*5* | Groove Depth Cross Groove Depth GD / CGD in / *µm* ±.0001/*3* | Groove Radius Cross Groove Radius GR /CGR in / *µm* (Ref) | Groove Opening Cross Groove Opening GO / CGO in / *µm* ±.0002/*5* | Useable Wire Diameter WD in / *µm* (Ref) |
| XGR | .0035 / *89* | .0040 / *102* | .0005 / *13* | .0006 / *15* | .0012 / *30* | .0010 / *25* |
| XGR | .0030 / *76* | .0035 / *89* | .0005 / *13* | .0006 / *15* | .0012 / *30* | .0010 / *25* |
| XGR | .0035 / *89* | .0040 / *102* | .0005 / *13* | .0008 / *20* | .0015 / *38* | .0010 / *25* |
| XGR | .0030 / *76* | .0035 / *89* | .0005 / *13* | .0008 / *20* | .0015 / *38* | .0010 / *25* |
| XGR | .0045 / *114* | .0055 / *140* | .0008 / *20* | .0010 / *25* | .0020 / *51* | .0015 / *38* |
| XGR | .0055 / *140* | .0060 / *152* | .0008 / *20* | .0010 / *25* | .0020 / *51* | .0015 / *38* |
| XGR | .0055 / *140* | .0060 / *152* | .0008 / *20* | .0012 / *30* | .0023 / *58* | .0015 / *38* |
| XGR | .0045 / *114* | .0055 / *140* | .0008 / *20* | .0012 / *30* | .0023 / *58* | .0015 / *38* |
| XGR | .0060 / *152* | .0070 / *178* | .0010 / *25* | .0012 / *30* | .0024 / *61* | .0020 / *51* |
| XGR | .0070 / *178* | .0080 / *230* | .0010 / *25* | .0012 / *30* | .0024 / *61* | .0020 / *51* |
| XGR | .0060 / *152* | .0070 / *178* | .0010 / *25* | .0015 / *38* | .0028 / *71* | .0020 / *51* |
| XGR | .0070 / *178* | .0080 / *203* | .0010 / *25* | .0015 / *38* | .0028 / *71* | .0020 / *51* |





| STYLE | |
|---|---|
| **XGR** | INSULATED WIRE BONDING WEDGE<br>STANDARD 10° BACK |

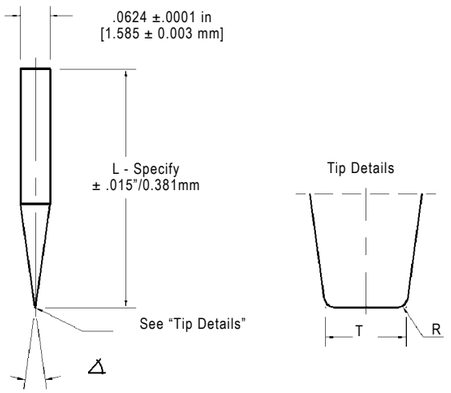
| MATERIAL | | FOOT LENGTH | TOOL LENGTH (TL) |
|---|---|---|---|
| **C** | Cermet composite for Gold Wire (recommended for Low Temperature bonding) | Will rely on specific application requirements (wire diameter used, bond pad size) – see dimension Table | S = .437 / *11.1 mm*<br>¾ = .750 / *19.05 mm*<br>L = .828 / *21.0 mm*<br>1.00 = 1.00 / *25.4 mm*<br>Longer lengths are available consult Bonder manufacturer for specifications. |
| **M** | Microloy (Osmium-Carbide Alloy) for Gold & Aluminum Wire | | |
| **TI** | Titanium Carbide Composite for Gold Wire | | |
| **W** | Tungsten Carbide Ultra Fine Grain for Aluminum Wire | | |

| FOOT OPTIONS | |
|---|---|
| **M** | Matte finish on tip |

| HOW TO ORDER | |
|---|---|
| **SPECIFY** | **Style – Material – Tool Diameter – Tool Length – Foot Design**<br>(Specify FL, W, GD, CGD, GR and CGR dimensions)<br>For Special Shank Style refer to page 61. |
| **EXAMPLE** | XGR – W – 1/16 – L - M<br>FL=.0055, W = .0060, GD = CGD = .0008, GR = CGR = .0010 |

## PF NEEDLE

PF20 bonding needles are normally used in Manual Thermocompression Bonders. They are mainly used in microwave applications where the bonding pads are too small to permit normal Ball and Stitch Bonding Techniques. Normally the wire is first positioned over the bonding pad area and then the bonding needle is used to make the bond. Wire diameters of .0010”/25µm or less are normally used in this application.







| STANDARD DIMENSIONS | | |
|---|---|---|
| **Tip Diameter T in / *µm* ±.0002/*5*** | **Radius R in / *µm* ±.0001/*3*** | **Included Angle △** |
| .0010 / *25* | .0002 / *5* | 30 or 15 |
| .0015 / *38* | .0002 / *5* | 30 or 15 |
| .0020 / *51* | .0003 / *8* | 30 or 15 |



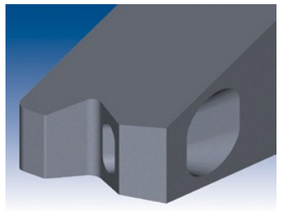
## GENERAL GUIDELINES ON HOW TO ORDER PF NEEDLES

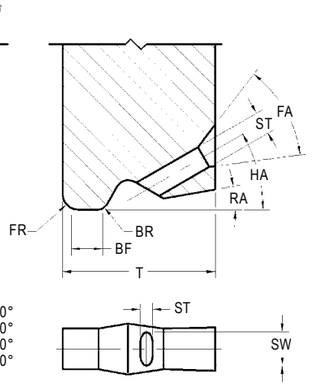
| STYLE |
|---|
| **PF20** = PERIPHERAL NEEDLE (.0010”/*25µm* or less wire diameter) |

| MATERIAL | | BOND FLAT | TOOL LENGTH (TL) |
|---|---|---|---|
| **W** | Tungsten Carbide Ultra Fine Grain for Aluminum Wire | Will rely on specific application requirements (wire diameter used, bond pad size) – see dimension Table | 1” = 1.000” / *25.4 µm*<br>½” = .500” / *12.7 µm* |

| HOW TO ORDER | |
|---|---|
| **SPECIFY** | **Style – Length – Tip Diameter (T) – Radius (R) - Included Angle (°)** |
| **EXAMPLE** | PF20 - 1” - .0020 - .0003 - 30°<br>PF20 - 1/2” - .0015 - .0002 - 30° |

# RIBBON WIRE BONDING TOOLS






RW30 HA = 30°, FA = 45°, RA = 10°
RW45 HA = 45°, FA = 45°, RA = 20°
RW55 HA = 55°, FA = 30°, RA = 20°
RW60 HA = 60°, FA = 30°, RA = 20°

**STANDARD DIMENSIONS**

| Tool Styles | Slot Width/ Bond Flat SW / BF | Ribbon Width RW in / *µm* Ref | Ribbon Thickness RT in / *µm* Ref | Slot Width SW in / *µm* ±.0003/*8* | Slot Thickness ST in / *µm* ±.0003/*8* | Bond Foot BF in / *µm* ±.0002/*5* | Foot Width W in / *µm* ±.0002/*5* | Clearance 30° & 45° Slots C in / *µm* Ref | Clearance 55° Slots C in / *µm* Ref | Tip Thickness 30°/38°Slots T in / *µm* ±.0005/*13* | Tip Thickness 45° Slots T in / *µm* ±.0005/*13* | Tip Thickness 55°/60° Slots T in / *µm* ±.0005/*13* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| RW30 RW45 RW55 RW60 | 0420* | .0020 / *51* | .0005/*13* | .0040 / *102* | .0020 / *51* | .0020 / *51* | .0055 / *140* | .0020 / *51* | .0030 / *76* | .0160 / *406* | .0140 / *356* | .0140 / *356* |
| | 0425 | .0020 / *51* | to | .0040 / *102* | .0020 / *51* | .0025 / *64* | .0055 / *140* | .0020 / *51* | .0030 / *76* | .0160 / *406* | .0140 / *356* | .0120 / *305* |
| | 0430 | .0020 / *51* | .0010/*25* | .0040 / *102* | .0020 / *51* | .0030 / *76* | .0055 / *140* | .0020 / *51* | .0030 / *76* | .0160 / *406* | .0140 / *356* | .0120 / *305* |
| | 0520 | .0030 / *76* | | .0050 / *127* | .0025 / *64* | .0020 / *51* | .0065 / *165* | .0020 / *51* | .0030 / *76* | .0160 / *406* | .0140 / *356* | .0120 / *305* |
| | 0525* | .0030 / *76* | | .0050 / *127* | .0025 / *64* | .0025 / *64* | .0065 / *165* | .0020 / *51* | .0030 / *76* | .0160 / *406* | .0140 / *356* | .0120 / *305* |
| | 0530 | .0030 / *76* | | .0050 / *127* | .0025 / *64* | .0030 / *76* | .0065 / *165* | .0020 / *51* | .0030 / *76* | .0180 / *457* | .0150 / *381* | .0140 / *356* |
| | 0540 | .0030 / *76* | .0005/*13* | .0050 / *127* | .0025 / *64* | .0040 / *102* | .0065 / *165* | .0020 / *51* | .0030 / *76* | .0180 / *457* | .0150 / *381* | .0140 / *356* |
| | 0620 | .0040 / *102* | to | .0060 / *152* | .0025 / *64* | .0020 / *51* | .0075 / *191* | .0020 / *51* | .0030 / *76* | .0160 / *406* | .0140 / *356* | .0120 / *305* |
| | 0625 | .0040 / *102* | .0010/*25* | .0060 / *152* | .0025 / *64* | .0025 / *64* | .0075 / *191* | .0020 / *51* | .0030 / *76* | .0160 / *406* | .0140 / *356* | .0120 / *305* |
| | 0630* | .0040 / *102* | | .0060 / *152* | .0025 / *64* | .0030 / *76* | .0075 / *191* | .0020 / *51* | .0030 / *76* | .0180 / *457* | .0150 / *381* | .0140 / *356* |
| | 0640 | .0040 / *102* | | .0060 / *152* | .0025 / *64* | .0040 / *102* | .0075 / *191* | .0020 / *51* | .0030 / *76* | .0180 / *457* | .0150 / *381* | .0140 / *356* |
| | 0725 | .0050 / *127* | | .0070 / *178* | .0030 / *76* | .0025 / *64* | .0085 / *216* | .0025 / *64* | .0040 / *102* | .0210 / *533* | .0160 / *406* | .0140 / *356* |
| | 0730 | .0050 / *127* | | .0070 / *178* | .0030 / *76* | .0030 / *76* | .0085 / *216* | .0025 / *64* | .0040 / *102* | .0210 / *533* | .0160 / *406* | .0140 / *356* |
| | 0740 | .0050 / *127* | .0005/*13* | .0070 / *178* | .0030 / *76* | .0040 / *102* | .0085 / *216* | .0025 / *64* | .0040 / *102* | .0210 / *533* | .0180 / *457* | .0160 / *406* |
| | 0750 | .0050 / *127* | to | .0070 / *178* | .0030 / *76* | .0050 / *127* | .0085 / *216* | .0025 / *64* | .0040 / *102* | .0210 / *533* | .0180 / *457* | .0160 / *406* |
| | 1125 | .0070 / *178* | .0020/*51* | .0110 / *279* | .0030 / *76* | .0025 / *64* | .0125 / *318* | .0025 / *64* | .0040 / *102* | .0210 / *533* | .0180 / *457* | .0160 / *406* |
| | 1130 | .0070 / *178* | | .0110 / *279* | .0030 / *76* | .0030 / *76* | .0125 / *318* | .0025 / *64* | .0040 / *102* | .0210 / *533* | .0180 / *457* | .0160 / *406* |
| | 1140* | .0070 / *178* | | .0110 / *279* | .0030 / *76* | .0040 / *102* | .0125 / *318* | .0025 / *64* | .0040 / *102* | .0210 / *533* | .0180 / *457* | .0160 / *406* |
| | SW / BF | Ref | Ref | ±.0005/*13* | ±.0003/*8* | ±.0002/*5* | ±.0005/*13* | Ref | Ref | ±.0005/*13* | ±.0005/*13* | ±.0005/*13* |
| | 1425 | .0100 / *254* | | .0140 / *356* | .0030 / *76* | .0025 / *64* | .0155 / *394* | .0025 / *64* | .0040 / *102* | .0210 / *533* | .0180 / *457* | .0140 / *356* |
| | 1430 | .0100 / *254* | | .0140 / *356* | .0030 / *76* | .0030 / *76* | .0155 / *394* | .0025 / *64* | .0040 / *102* | .0210 / *533* | .0180 / *457* | .0140 / *356* |
| | 1440 | .0100 / *254* | | .0140 / *356* | .0030 / *76* | .0040 / *102* | .0155 / *394* | .0025 / *64* | .0040 / *102* | .0210 / *533* | .0180 / *457* | .0140 / *356* |
| | 1625 | .0120 / *305* | | .0160 / *406* | .0030 / *76* | .0025 / *64* | .0175 / *445* | .0025 / *64* | .0040 / *102* | .0210 / *533* | .0180 / *457* | .0140 / *356* |
| | 1630 | .0120 / *305* | | .0160 / *406* | .0030 / *76* | .0030 / *76* | .0175 / *445* | .0025 / *64* | .0040 / *102* | .0210 / *533* | .0180 / *457* | .0140 / *356* |
| | 1640* | .0120 / *305* | .0005/*13* | .0160 / *406* | .0030 / *76* | .0040 / *102* | .0175 / *445* | .0025 / *64* | .0040 / *102* | .0210 / *533* | .0180 / *457* | .0160 / *406* |
| | 1650 | .0120 / *305* | to | .0160 / *406* | .0030 / *76* | .0050 / *127* | .0175 / *445* | .0025 / *64* | .0040 / *102* | .0210 / *533* | .0180 / *457* | .0160 / *406* |
| | 1925 | .0150 / *381* | .0020/*51* | .0190 / *483* | .0030 / *76* | .0025 / *64* | .0205 / *521* | .0025 / *64* | .0040 / *102* | .0210 / *533* | .0180 / *457* | .0140 / *356* |
| | 1930 | .0150 / *381* | | .0190 / *483* | .0030 / *76* | .0030 / *76* | .0205 / *521* | .0025 / *64* | .0040 / *102* | .0210 / *533* | .0180 / *457* | .0140 / *356* |
| | 1940* | .0150 / *381* | | .0190 / *483* | .0030 / *76* | .0040 / *102* | .0205 / *521* | .0025 / *64* | .0040 / *102* | .0210 / *533* | .0180 / *457* | .0160 / *406* |
| | 2425 | .0200 / *508* | | .0240 / *610* | .0030 / *76* | .0025 / *64* | .0255 / *648* | .0025 / *64* | .0040 / *102* | .0210 / *533* | .0180 / *457* | .0140 / *356* |
| | 2430 | .0200 / *508* | | .0240 / *610* | .0030 / *76* | .0030 / *76* | .0255 / *648* | .0025 / *64* | .0040 / *102* | .0210 / *533* | .0180 / *457* | .0140 / *356* |
| | 2440 | .0200 / *508* | | .0240 / *610* | .0030 / *76* | .0040 / *102* | .0255 / *648* | .0025 / *64* | .0040 / *102* | .0210 / *533* | .0180 / *457* | .0160 / *406* |
| | 2450* | .0200 / *508* | | .0240 / *610* | .0030 / *76* | .0050 / *127* | .0255 / *648* | .0025 / *64* | .0040 / *102* | .0210 / *533* | .0180 / *457* | .0160 / *406* |

- * Most commonly specified
- Standard FR and BR : FR = .0010" / *25*µm and BR = .0003" / *8*µm is standard.
- Max Ribbon size for a vertical shank (1/16) is .012" / *305*µm ribbon.



# RIBBON WIRE TOOLS - GENERAL GUIDELINES ON HOW TO ORDER

| STYLE | | FEED ANGLE |
|---|---|---|
| **RW** = RIBBON WIRE | SLIMLINE BACK | 30°, 45°, 55°, 60° |

| MATERIAL | | HOLE / BOND FLAT | TOOL LENGTH (TL) |
|---|---|---|---|
| **C** | Cermet composite for Gold Ribbon Wire (recommended for Low Temperature bonding) | Will rely on specific application requirements (wire diameter used, bond pad size) – see dimension Table | S = .437 / *11.1 mm*<br>¾ = .750 / *19.05 mm*<br>L = .828 / *21.0 mm*<br>1.00 = 1.00 / *25.4 mm*<br>Longer lengths are available consult Bonder manufacturer for specifications. |
| **M** | Microloy (Osmium-Carbide Alloy) for Gold & Aluminum Ribbon Wire | | |
| **TI** | Titanium Carbide Composite for Gold Ribbon Wire | | |
| **W** | Tungsten Carbide Ultra Fine Grain for Aluminum Ribbon Wire | | |

| FOOT OPTIONS | |
|---|---|
| **FM** | Flat foot design with the FR, BR and BF matte. (Standard) |
| **CGM** | Cross Groove with the FR and BR matte. Not recommended for BFsmaller than .0020"/50µm |

| HOW TO ORDER | |
|---|---|
| **SPECIFY** | **Style – Material – SW/BF – Tool Diameter – Foot Option** |
| **EXAMPLE** | RW45 - TI - 1140 - 1/16 - L - CGM<br>RW45 - TI - 0530 - 1/16 - L - FM |

Large Wire Bonding is defined as wire diameters in the range of .003”/75µm to .020”/500µm. Tools designed to bond .003” wire diameter will bond 75µm wire diameters equally well.

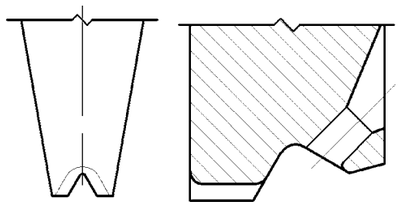
Wire material most commonly used is 99.99% aluminum however, aluminum-magnesium (AlMg) is also used. The choice of aluminum wire used depends largely on the material being bonded to (die pad metallization). The AlMg wire material is much harder than pure aluminum. Materials of approximately the same hardness bond together best. That is, if the die metallization is soft, then the softer pure aluminum wire will form a weldment easier than the harder AlMg. If the metallization is harder then the AlMg wire material will work best. Many times the metallization of the die is soft and the metallization of the lead is hard…making the wire material optimum for one area and opposite for the other bonding target. If one is having a weldment problem with one particular metallization (die / lead) it is good to keep in mind the hardness differences between the two targets can help you to pin point the cause of the bonding issues. In most cases, however, the wire composition is specified for the product and the bond engineer has no choice as to whether 99.9% Al or AlMg can be used.

There are four basic types of large wire tools geometry, and Groove designs most commonly used for wire bonding. These designs overtime have been driven through the collaboration between the OEM and customer. The designs overtime have been the standards for the industry. The tool geometry are dedicated to a particular wirebonder. Groove designs, bond lengths are commonly driven by the customer requirements.

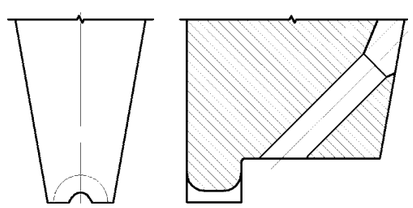
## TOOL GEOMETRY

There are 4 basic types of large wire tool geometry. They include notch tools, L-notch tools, AutoBonding tools®, and No-hole tools.

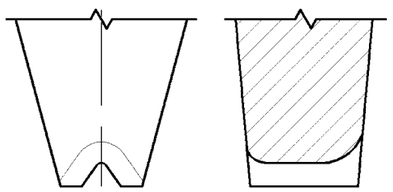
**30D6 STYLE**



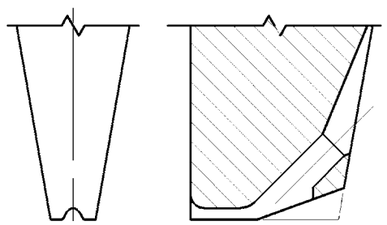
**4516 STYLE**



**OSG7 STYLE**



**AB16 STYLE**



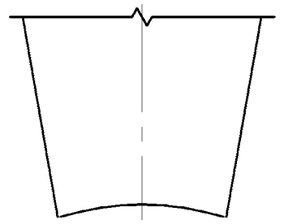
The No-hole style tools require a separate wire feed guide which guides the wire just behind the tool, and travels in unison with the tools movement. All other types of tools have an integrated wire feed hole at various angles to the bond plane. The bonding machine being used determines the tool design that is chosen. AutoBonding Tools® help guide the wire directly under the foot this design is commonly used where L-notch tools experience wire control problems where different bonding heights and extreme long wires are bonded.



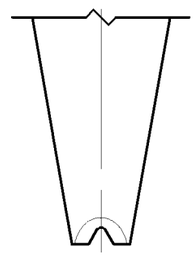
## GROOVE DESIGNS

There are 5 different styles of groove designs. They include Concave, Inline groove, “V” groove, Deep “V” groove and “U” groove designs

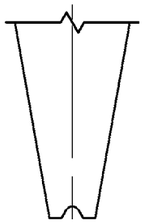
**1009A CONCAVE FOOT STYLE**



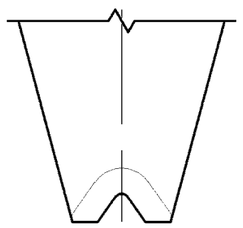
**1016A INLINE GROOVE STYLE**



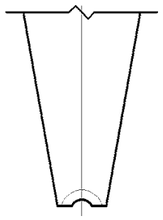
**AB16 V GROOVE STYLE**



**OSG7 DEEP V GROOVE STYLE**



**1015A U GROOVE STYLE**

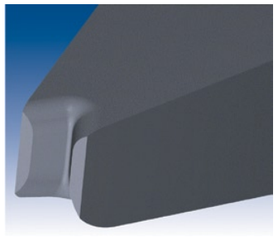


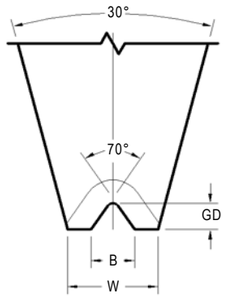
The evolution of the groove designs have evolved by necessity due to the progress made in the development of better materials for bonding, Mold compounds, improved lead frame designs to minimize package delamination, faster bonders and the shrinkage of real-estate to bond to has pushed the tool design to more of a “V” groove type tool with no-hole allowing for bonding in tight conditions where other tools designs are becoming obsolete. Initially bigger bonds were considered to be more reliable but basically were used as a band-aid to compensate for the inequities of the materials.

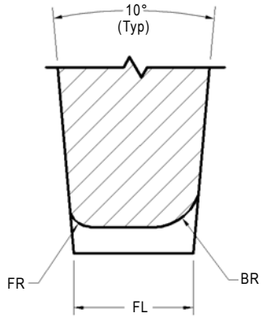
The integration of power and logic (SmartMos®) has set new standards for bonding large wire. The package, silicon, and pad size has shrunk by 25 to 30% in some cases pushing the design rules to its limit.

For special bonding requirements contact the factory for designs and availability.

## OSG7 STYLE






| STANDARD DIMENSIONS | | | | | | | |
|---|---|---|---|---|---|---|---|
| Tool Styles - Wire Size | Useable Wire Diameter WD in / *µm* | Foot Length FL in / *µm* ±.0005/*13* | Front Radius FR in / *µm* (Ref) | Back Radius BR in / *µm* (Ref) | Foot Width W in / *µm* ±.0005/*13* | Groove Depth GD in / *µm* Min | Groove Opening B in / *µm* ±.0003/*8* |
| OSG7- 4 | .0040 / *100* | .0114 / *290* | .0027 / *69* | .0054 / *137* | .0080 / *200* | .0027 / *69* | .0046 / *117* |
| OSG7- 5 | .0050 / *125* | .0142 / *361* | .0034 / *86* | .0068 / *173* | .0100 / *254* | .0034 / *86* | .0057 / *145* |
| OSG7- 6 | .0060 / *150* | .0170 / *432* | .0041 / *104* | .0082 / *208* | .0120 / *305* | .0040 / *102* | .0068 / *173* |
| OSG7- 7 | .0070 / *175* | .0199 / *505* | .0048 / *122* | .0096 / *244* | .0140 / *356* | .0048 / *122* | .0080 / *203* |
| OSG7- 8 | .0080 / *200* | .0226 / *574* | .0054 / *137* | .0109 / *277* | .0160 / *406* | .0055 / *140* | .0091 / *231* |
| | | ±.0010/*25* | (Ref) | (Ref) | ±.0010/*25* | Min (75%) | ±.0005/*13* |
| OSG7- 10 | .0100 / *250* | .0283 / *719* | .0068 / *173* | .0136 / *345* | .0200 / *508* | .0075 / *191* | .0122 / *310* |
| OSG7- 12 | .0120 / *300* | .0340 / *864* | .0082 / *208* | .0163 / *414* | .0240 / *610* | .0090 / *229* | .0146 / *371* |
| OSG7- 14 | .0140 / *356* | .0396 / *1006* | .0095 / *241* | .0190 / *483* | .0280 / *711* | .0105 / *267* | .0171 / *434* |
| OSG7- 15 | .0150 / *381* | .0425 / *1080* | .0102 / *259* | .0204 / *518* | .0300 / *762* | .0113 / *287* | .0183 / *465* |
| OSG7- 16 | .0160 / *400* | .0440 / *1118* | .0106 / *269* | .0211 / *536* | .0320 / *813* | .0118 / *300* | .0195 / *495* |
| OSG7- 18 | .0180 / *450* | .0510 / *1295* | .0122 / *310* | .0245 / *622* | .0363 / *922* | .0140 / *356* | .0220 / *559* |
| OSG7- 20 | .0200 / *500* | .0566 / *1438* | .0136 / *345* | .0272 / *691* | .0400 / *1016* | .0150 / *381* | .0244 / *620* |





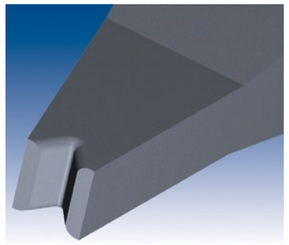
| STYLE | | WIRE SIZE | MATERIAL | |
|---|---|---|---|---|
| **OSG7 :** | 70° Deep "V" Groove | Specify Wire Size | **W :** | Tungsten Carbide Ultra Fine Grain for Aluminum Wire |

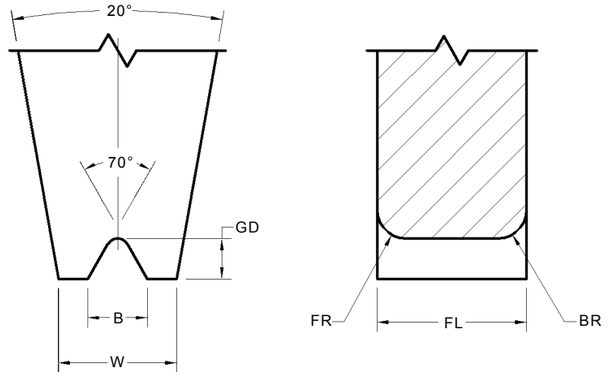
| Tool Dia | TD in / *mm* ±.0001"/*3µm* | TDF in / *mm* ±.0005"/*13µm* | Specified Length | TL in / *mm* ±.005"/*130µm* |
|---|---|---|---|---|
| 1/8 | .1249 / *3.172* | .110 / *2.794* | 2.50 | 2.500 / *63.50* |

| FOOT OPTIONS | |
|---|---|
| **G** | The FR and BR are polished and a fine matte finish is within the area of the groove. (Standard) |
| **GM** | The FR, BR and groove have a matte finish |

| HOW TO ORDER | |
|---|---|
| **SPECIFY** | **Style - Wire - Material - Tool Diameter - Tool Length - Foot Option**<br>(For modifications to standard tools, use part number and specify modified dimensions or contact our technical support staff for assistance with your requirements). For Shank Style refer to page 62. |
| **EXAMPLE** | OSG7 - 10 - W - 1/8 - 2.50 - G |

## CKVD STYLE






**STANDARD DIMENSIONS**

| Tool Styles - Wire Size | Useable Wire Diameter WD in / *µm* | Foot Length FL in / *µm* ±.0003/*8* | Front/Back Radius FR = BR in / *µm* (Ref) | Foot Width W in / *µm* ±.0003/*8* | Groove Depth GD in / *µm* Min | Groove Opening B in / *µm* ±.0003/*8* | Relief E in / *µm* ±.0039/*100* |
|---|---|---|---|---|---|---|---|
| CKVD-100 | .0040 / *100* | .0098 / *250* | .0012 / *30* | .0079 / *200* | .0028 / *71* | .0043 / *109* | .0390 / *1000* |
| CKVD-125 | .0050 / *125* | .0118 / *300* | .0015 / *38* | .0098 / *250* | .0035 / *89* | .0054 / *137* | .0390 / *1000* |
| CKVD-150 | .0060 / *150* | .0138 / *350* | .0018 / *45* | .0118 / *300* | .0042 / *107* | .0065 / *165* | .0390 / *1000* |
| CKVD-175 | .0070 / *175* | .0157 / *400* | .0021 / *53* | .0138 / *350* | .0049 / *124* | .0076 / *193* | .0390 / *1000* |
| CKVD-200 | .0080 / *200* | .0177 / *450* | .0024 / *61* | .0157 / *400* | .0056 / *142* | .0087 / *221* | .0390 / *1000* |
| | | ±.0005/*13* | (Ref) | ±.0005/*13* | Min | ±.0005/*13* | ±.0039/*100* |
| CKVD-250 | .0100 / *250* | .0217 / *551* | .0030 / *76* | .0197 / *500* | .0070 / *178* | .0108 / *274* | .0590 / *1500* |
| CKVD-300 | .0120 / *300* | .0256 / *650* | .0035 / *89* | .0236 / *600* | .0084 / *213* | .0130 / *330* | .0590 / *1500* |
| CKVD-350 | .0140 / *350* | .0299 / *760* | .0041 / *104* | .0276 / *700* | .0098 / *249* | .0152 / *386* | .0590 / *1500* |
| CKVD-380 | .0150 / *380* | .0323 / *820* | .0045 / *114* | .0299 / *760* | .0106 / *269* | .0165 / *419* | .0590 / *1500* |
| CKVD-400 | .0160 / *400* | .0343 / *871* | .0047 / *119* | .0315 / *800* | .0112 / *284* | .0173 / *439* | .0590 / *1500* |
| CKVD-500 | .0200 / *500* | .0433 / *110* | .0059 / *150* | .0394 / *1000* | .0140 / *356* | .0217 / *551* | .0590 / *1500* |





| STYLE | WIRE SIZE | MATERIAL |
|---|---|---|
| **CKVD :** 70° Deep "V" Groove | Specify Wire Size | **W :** Tungsten Carbide Ultra Fine Grain for Aluminum Wire |

| Tool Dia | TD in / *mm* ±.0001"/*3µm* | TDF in / *mm* ±.0005"/*13µm* | Specified Length | TL in / *mm* ±.005"/*130µm* |
|---|---|---|---|---|
| 1/16 | .0624 / *1.585* | .0570 / *1.448* * | L | .828 / *21.0* |
| 1/8 | .1249 / *3.172* | .0937 / *2.378* *** | 1.00 | 1.000 / *25.4* |
| 2mm | .0785 / *1.995* @ | .0630 / *1.600* * | 20mm | .787 / *20.0* |
| 3mm | .1180 / *2.997* | .0985 / *2.502* ** | 29mm | 1.142 / *29.0* |

**NOTE**

| | |
|---|---|
| Length | 29mm for Deep Access |
| * | limited size availability. |
| ** | .110" / 2.79mm TDF supplied if required by foot geometry. |
| *** | .1180" / 3.00mm TDF supplied if required by foot geometry. |
| @ | Tolerance +0 / - .0002" / 5µm |

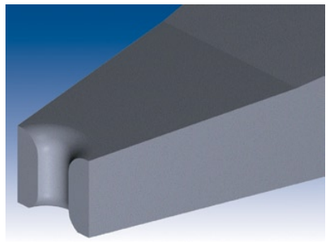
**FOOT OPTIONS**

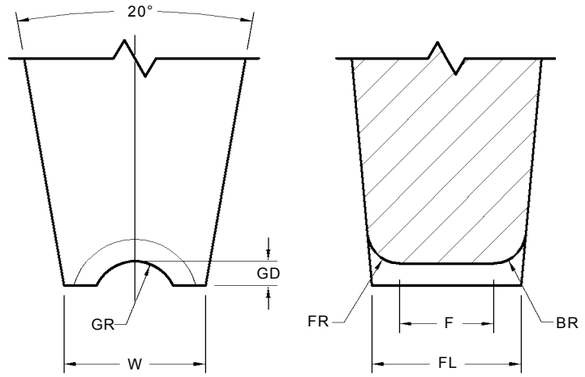
| | |
|---|---|
| **G** | The FR and BR are polished and a fine matte finish is within the area of the groove. (Standard) |
| **GM** | The FR, BR and groove have a matte finish |

**HOW TO ORDER**

| | |
|---|---|
| **SPECIFY** | **Style - Wire - Material - Tool Diameter - Tool Length - Foot Option** (For modifications to standard tools, use part number and specify modified dimensions or contact our technical support staff for assistance with your requirements). For Shank Style refer to page 62. |
| **EXAMPLE** | CKVD - 250 - W - 2mm - 29mm - G |

## CK STYLE






**STANDARD DIMENSIONS**

| Tool Styles - Wire Size | Useable Wire Diameter WD in / *µm* | Foot Length FL in / *µm* ±.0005/*13* | Front/Back Radius FR = BR in / *µm* ±.0005/*13* | Flat F in / *µm* (Ref) | Foot Width W in / *µm* ±.0005/*13* | Groove Depth GD in / *µm* ±.0002/*5* | Groove Radius GR in / *µm* ±.0002/*5* |
|---|---|---|---|---|---|---|---|
| CK-75 | .0030 / *75* | .0065 / *165* | .0018 / *46* | .0030 / *76* | .0075 / *191* | .0010 / *25* | .0018 / *46* |
| CK-100 | .0040 / *100* | .0090 / *229* | .0024 / *61* | .0039 / *99* | .0100 / *254* | .0014 / *36* | .0024 / *61* |
| CK-125 | .0050 / *125* | .0110 / *279* | .0030 / *76* | .0049 / *124* | .0120 / *305* | .0017 / *43* | .0030 / *76* |
| CK-150 | .0060 / *150* | .0130 / *330* | .0035 / *89* | .0059 / *150* | .0150 / *381* | .0021 / *53* | .0035 / *89* |
| CK-175 | .0070 / *175* | .0150 / *381* | .0041 / *104* | .0069 / *175* | .0170 / *432* | .0024 / *61* | .0041 / *104* |
| CK-200 | .0080 / *200* | .0170 / *432* | .0047 / *119* | .0079 / *201* | .0200 / *508* | .0028 / *71* | .0047 / *119* |





| STYLE | | WIRE SIZE | MATERIAL | |
|---|---|---|---|---|
| **CK :** | Inline Groove | Specify Wire Size | **W :** | Tungsten Carbide Ultra Fine Grain for Aluminum Wire |

| Tool Dia | TD in / *mm* ±.0001"/*3µm* | TDF in / *mm* ±.0005"/*13µm* | Specified Length | TL in / *mm* ±.005"/*130µm* |
|---|---|---|---|---|
| 1/16 | .0624 / *1.585* | .0570 / *1.448* * | L | .828 / *21.0* |
| 1/8 | .1249 / *3.172* | .0937 / *2.378* *** | 1.00 | 1.000 / *25.4* |
| 2mm | .0785 / *1.995* @ | .0630 / *1.600* * | 20mm | .787 / *20.0* |
| 3mm | .1180 / *2.997* | .0985 / *2.502* ** | 29mm | 1.142 / *29.0* |

**NOTE**

| | |
|---|---|
| * | limited size availability. |
| ** | .110" / 2.79mm TDF supplied if required by foot geometry. |
| *** | .1180" / 3.00mm TDF supplied if required by foot geometry. |
| @ | Tolerance +0 / - .0002" / 5µm |

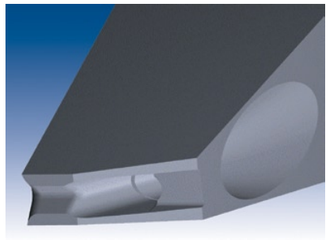
**FOOT OPTIONS**

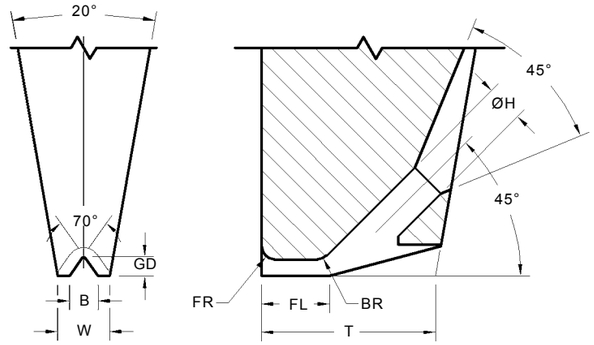
| | |
|---|---|
| **G** | The FR and BR are polished and a fine matte finish is within the area of the groove. (Standard) |
| **GM** | The FR, BR and groove have a matte finish |

**HOW TO ORDER**

| | |
|---|---|
| **SPECIFY** | **Style - Wire - Material - Tool Diameter - Tool Length - Foot Option**<br>(For modifications to standard tools, use part number and specify modified dimensions or contact our technical support staff for assistance with your requirements). For Shank Style refer to page 62. |
| **EXAMPLE** | CK - 200 - W - 2mm - 29mm - G<br>CK - 150 - W - 2mm - 29mm - GM<br>CK - 200 - W - 3mm - 20mm - G |

## 45CK STYLE






| STANDARD DIMENSIONS | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Tool Styles - Wire Size | Useable Wire Diameter WD in / *µm* | Hole Diameter in / *µm* ±.0005/*13* | Foot Length FL in / *µm* ±.0005/*13* | Front/Back Radius FR = BR in / *µm* (Ref) | Foot Width W in / *µm* ±.0005/*13* | Tip Length T in / *µm* ±.0010/*25* | Groove Depth GD in / *µm* Min | Groove Opening B in / *µm* ±.0003/*18* |
| 45CK-75 | .0030 / *75* | .0055 / *140* | .0070 / *178* | .0015 / *38* | .0070 / *178* | .0270 / *686* | .0018 / *46* | .0032 / *81* |
| 45CK-100 | .0040 / *100* | .0059 / *150* | .0073 / *185* | .0020 / *51* | .0079 / *200* | .0290 / *737* | .0026 / *65* | .0043 / *110* |
| 45CK-125 | .0050 / *125* | .0074 / *188* | .0086 / *219* | .0025 / *64* | .0098 / *250* | .0340 / *864* | .0032 / *81* | .0054 / *137* |
| 45CK-150 | .0060 / *150* | .0089 / *226* | .0100 / *254* | .0030 / *76* | .0118 / *300* | .0400 / *1016* | .0038 / *97* | .0065 / *165* |
| 45CK-175 | .0070 / *175* | .0103 / *262* | .0105 / *267* | .0035 / *89* | .0138 / *350* | .0470 / *1194* | .0045 / *114* | .0076 / *193* |
| 45CK-200 | .0080 / *200* | .0118 / *300* | .0106 / *270* | .0039 / *100* | .0157 / *400* | .0540 / *1372* | .0051 / *130* | .0087 / *221* |
| | | ±.0005/*13* | ±.0005/*13* | (Ref) | ±.0005/*13* | ±.0010/*25* | Min | ±.0005/*13* |
| 45CK-250 | .0100 / *250* | .0148 / *376* | .0133 / *338* | .0046 / *125* | .0197 / 500 | .0063 / *1600* | .0064 / *163* | .0108 / *274* |





| STYLE | FEED ANGLE |
|---|---|
| **45CK :** Inline and 70° "V" Groove | 45°<br>60° wire feed available with slimline |

| WIRE SIZE | MATERIAL |
|---|---|
| Specify Wire Size | **W :** Tungsten Carbide Ultra Fine Grain for Aluminum Wire |

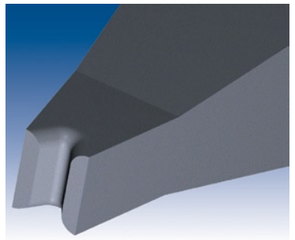
| Tool Dia | TD in / *mm* ±.0001"/*3µm* | TDF in / *mm* ±.0005"/*13µm* | Specified Length | TL in / *mm* ±.005"/*130µm* |
|---|---|---|---|---|
| 1/16 | .0624 / *1.585* | .0570 / *1.448* * | L | .828 / *21.0* |
| 1/8 | .1249 / *3.172* | .0937 / *2.378* *** | 1.00 | 1.000 / *25.4* |
| 2mm | .0785 / *1.995* @ | .0630 / *1.600* * | 20mm | .787 / *20.0* |
| 3mm | .1180 / *2.997* | .0985 / *2.502* ** | 29mm | 1.142 / *29.0* |

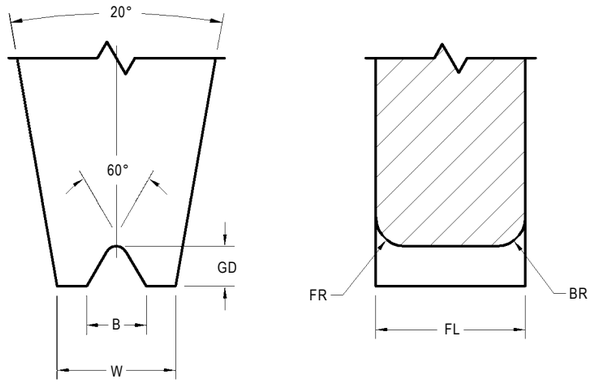
| NOTE | |
|---|---|
| * | limited size availability. |
| ** | .110" / 2.79mm TDF supplied if required by foot geometry. |
| *** | .1180" / 3.00mm TDF supplied if required by foot geometry. |
| @ | Tolerance +0 / - .0002" / 5µm |

| FOOT OPTIONS | |
|---|---|
| **G** | The FR and BR are polished and a fine matte finish is within the area of the groove. (Standard) |
| **GM** | The FR, BR and groove have a matte finish |

| HOW TO ORDER | |
|---|---|
| **SPECIFY** | **Style - Wire - Material - Tool Diameter - Tool Length - Foot Option**<br>(For modifications to standard tools, use part number and specify modified dimensions or contact our technical support staff for assistance with your requirements). For Shank Style refer to page 62. |
| **EXAMPLE** | 45CK - 200 - W - 2mm - 29mm - G |

## LWD6 STYLE






| STANDARD DIMENSIONS | | | | | | | |
|---|---|---|---|---|---|---|---|
| Tool Styles - Wire Size | Useable Wire Diameter WD in / *µm* | Foot Length FL in / *µm* ±.0003/*8* | Front/Back Radius FR = BR in / *µm* (Ref) | Foot Width W in / *µm* ±.0003/*8* | Groove Depth GD in / *µm* Min | Groove Opening B in / *µm* ±.0003/*8* | Relief E in / *µm* ±.010/*254* -*0* |
| LWD6-75 | .0030 / *75* | .0080 / *203* | .0015 / *38* | .0075 / *191* | .0021 / *53* | .0033 / *84* | .0200 / *508* |
| LWD6-100 | .0040 / *100* | .0105 / *267* | .0020 / *51* | .0100 / *254* | .0028 / *71* | .0044 / *112* | .0200 / *508* |
| LWD6-125 | .0050 / *125* | .0130 / *330* | .0025 / *64* | .0120 / *305* | .0035 / *89* | .0055 / *140* | .0200 / *508* |
| LWD6-150 | .0060 / *150* | .0155 / *394* | .0030 / *76* | .0140 / *356* | .0042 / *107* | .0066 / *168* | .0200 / *508* |
| LWD6-175 | .0070 / *175* | .0180 / *457* | .0035 / *89* | .0155 / *394* | .0049 / *124* | .0077 / *196* | .0200 / *508* |
| LWD6-200 | .0080 / *200* | .0205 / *521* | .0040 / *102* | .0175 / *445* | .0056 / *142* | .0088 / *224* | .0200 / *508* |
| | | ±.0005/*13* | (Ref) | ±.0005/*13* | Min | ±.0005/*13* | ±.010/*254* -*0* |
| LWD6-250 | .0100 / *250* | .0270 / *686* | .0050 / *127* | .0215 / *546* | .0070 / *178* | .0110 / *279* | .0400 / *1016* |
| LWD6-300 | .0120 / *300* | .0305 / *775* | .0060 / *152* | .0255 / *648* | .0084 / *213* | .0132 / *335* | .0400 / *1016* |
| LWD6-350 | .0140 / *350* | .0330 / *838* | .0070 / *178* | .0295 / *749* | .0098 / *249* | .0154 / *391* | .0400 / *1016* |
| LWD6-380 | .0150 / *380* | .0345 / *876* | .0075 / *191* | .0315 / *800* | .0105 / *267* | .0165 / *419* | .0600 / *1524* |
| LWD6-400 | .0160 / *400* | .0355 / *902* | .0080 / *203* | .0335 / *851* | .0112 / *284* | .0176 / *447* | .0600 / *1524* |
| LWD6-500 | .0200 / *500* | .0445 / *1130* | .0100 / *254* | .0415 / *1054* | .0140 / *356* | .0220 / *559* | .0600 / *1524* |





| STYLE | WIRE SIZE | MATERIAL |
|---|---|---|
| **LWD6 :** 60° Deep "V" Groove | Specify Wire Size | **W :** Tungsten Carbide Ultra Fine Grain for Aluminum Wire |

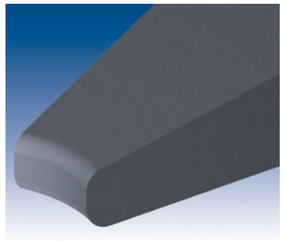
| Tool Dia | TD in / *mm* ±.0001"/*3µm* | TDF in / *mm* ±.0005"/*13µm* | Specified Length | TL in / *mm* ±.005"/*130µm* |
|---|---|---|---|---|
| 1/16 | .0624 / *1.585* | .0570 / *1.448* * | L | .828 / *21.0* |
| 1/8 | .1249 / *3.172* | .0937 / *2.378* *** | 1.00 | 1.000 / *25.4* |
| 2mm | .0785 / *1.995* @ | .0630 / *1.600* * | 20mm | .787 / *20.0* |
| 3mm | .1180 / *2.997* | .0985 / *2.502* ** | 30mm | 1.181 / *30.0* |

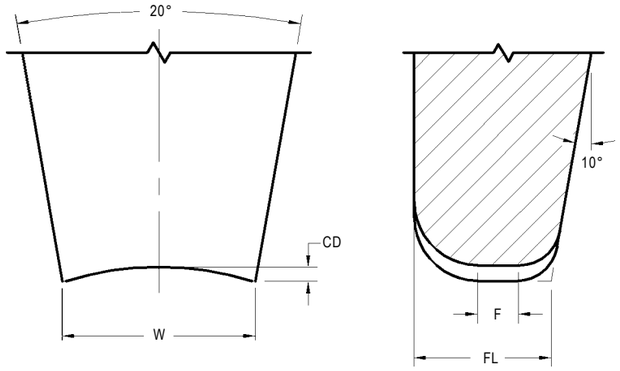
| NOTE | |
|---|---|
| * | limited size availability. |
| ** | .110" / 2.79mm TDF supplied if required by foot geometry. |
| *** | .1180" / 3.00mm TDF supplied if required by foot geometry. |
| @ | Tolerance +0 / - .0002" / 5µm |

| FOOT OPTIONS | |
|---|---|
| **G** | The FR and BR are polished and a fine matte finish is within the area of the groove. (Standard) |
| **GM** | The FR, BR and groove have a matte finish |

| HOW TO ORDER | |
|---|---|
| **SPECIFY** | **Style - Wire - Material - Tool Diameter - Tool Length - Foot Option**<br>(For modifications to standard tools, use part number and specify modified dimensions or contact our technical support staff for assistance with your requirements). For Shank Style refer to page 62. |
| **EXAMPLE** | LWD6 - 250 - W - 1/8 - 1.00 - G<br>LWD6 - 350 - W - 1/8 - 1.00 - G |

## 1009A STYLE









**STANDARD DIMENSIONS**

| Tool Styles - Wire Size | Useable Wire Diameter WD in / *µm* | Foot Length FL in / *µm* ±.0005/*13* | Front Radius FR in / *µm* ±.0005/*13* | Back Radius BR in / *µm* ±.0003/*8* | Flat F in / *µm* (Ref) | Foot Width W in / *µm* ±.0005/*13* | Concave Depth CD in / *µm* ±.0002/*5* |
|---|---|---|---|---|---|---|---|
| 1009A-4 | .0040 / *100* | .0160 / *406* | .0080 / *203* | .0050 / *127* | .0055 / *140* | .0120 / *305* | .0010 / *25* |
| 1009A-5 | .0050 / *125* | .0180 / *457* | .0090 / *229* | .0050 / *127* | .0070 / *178* | .0150 / *381* | .0013 / *33* |
| 1009A-6 | .0060 / *150* | .0180 / *457* | .0090 / *229* | .0060 / *152* | .0065 / *165* | .0180 / *457* | .0016 / *41* |
| 1009A-7 | .0070 / *175* | .0180 / *457* | .0090 / *229* | .0060 / *152* | .0065 / *165* | .0210 / *533* | .0018 / *46* |
| 1009A-8 | .0080 / *200* | .0180 / *457* | .0090 / *229* | .0060 / *152* | .0065 / *165* | .0240 / *610* | .0020 / *51* |





| STYLE | WIRE SIZE | MATERIAL |
|---|---|---|
| **1009A :** Concave No-Hole | Specify Wire Size | **W :** Tungsten Carbide Ultra Fine Grain for Aluminum Wire |

| Tool Dia | TD in / *mm* ±.0001"/*3µm* | TDF in / *mm* ±.0005"/*13µm* | Specified Length | TL in / *mm* ±.005"/*130µm* |
|---|---|---|---|---|
| 1/16 | .0624 / *1.585* | .0570 / *1.448* * | L | .828 / *21.0* |
| 1/8 | .1249 / *3.172* | .0937 / *2.378* *** | 1.00 | 1.000 / *25.4* |
| 2mm | .0785 / *1.995* @ | .0630 / *1.600* * | 20mm | .787 / *20.0* |
| 3mm | .1180 / *2.997* | .0985 / *2.502* ** | 29mm | 1.142 / *29.0* |

**NOTE**

| | |
|---|---|
| * | limited size availability. |
| ** | .110" / 2.79mm TDF supplied if required by foot geometry. |
| *** | .1180" / 3.00mm TDF supplied if required by foot geometry. |
| @ | Tolerance +0 / - .0002" / 5µm |

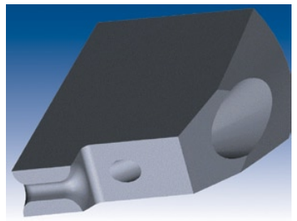
**FOOT OPTIONS**

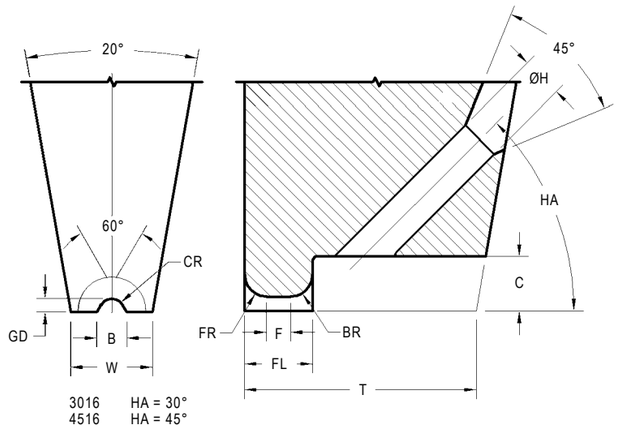
| | |
|---|---|
| **C** | The FR and BR are polished and a fine matte finish is within the area of the groove. (Standard) |
| **CM** | The FR, BR and groove have a matte finish |

**HOW TO ORDER**

| | |
|---|---|
| **SPECIFY** | **Style - Wire - Material - Tool Diameter - Tool Length - Foot Option**<br>(For modifications to standard tools, use part number and specify modified dimensions or contact our technical support staff for assistance with your requirements). For Shank Style refer to page 62. |
| **EXAMPLE** | 1009A - 5 - W - 3mm - L - CM<br>1009A - 8 - W - 1/8 - L - C |

## 3016 / 4516 STYLE






**STANDARD DIMENSIONS**

| Tool Styles | Useable Wire Diameter WD in / *µm* | 4516 / 3016 Hole Dia H in / *µm* ±.0002/*5* | Foot Length FL in / *µm* ±.0005/*13* | Front Radius FR in / *µm* ±.0005/*13* | Back Radius BR in / *µm* ±.0005/*13* | Flat F in / *µm* (Ref) | 4516 / 3016 Foot Width W in / *µm* ±.0002/*5* | 4516 / 3016 Clearance C in / *µm* (Ref) | 4516 Series Tip Length T in / *µm* ±.0010/*25* | 3016 Series Tip Length T in / *µm* ±.0010/*25* |
|---|---|---|---|---|---|---|---|---|---|---|
| 3S | .0030 / *75* | .0045 / *114* | .0085 / *216* | .0024 / *61* | .0036 / *91* | .0025 / *64* | .0090 / *229* | .0080 / *203* | .0270 / *686* | .0300 / *762* |
| 3R | .0030 / *75* | .0045 / *114* | .0095 / *241* | .0024 / *61* | .0036 / *91* | .0035 / *89* | .0090 / *229* | .0080 / *203* | .0280 / *711* | .0310 / *787* |
| 3XL | .0030 / *75* | .0045 / *114* | .0120 / *305* | .0024 / *61* | .0036 / *91* | .0060 / *152* | .0090 / *229* | .0080 / *203* | .0300 / *762* | .0330 / *838* |
| 4S | .0040 / *100* | .0060 / *152* | .0110 / *279* | .0032 / *81* | .0048 / *122* | .0030 / *76* | .0120 / *305* | .0100 / *254* | .0350 / *889* | .0390 / *991* |
| 4R | .0040 / *100* | .0060 / *152* | .0130 / *330* | .0032 / *81* | .0048 / *122* | .0050 / *127* | .0120 / *305* | .0100 / *254* | .0370 / *940* | .0410 / *1041* |
| 4XL | .0040 / *100* | .0060 / *152* | .0160 / *406* | .0032 / *81* | .0048 / *122* | .0080 / *203* | .0120 / *305* | .0100 / *254* | .0400 / *1016* | .0440 / *1118* |
| 5S | .0050 / *125* | .0075 / *191* | .0140 / *356* | .0040 / *102* | .0060 / *152* | .0040 / *102* | .0150 / *381* | .0115 / *292* | .0440 / *1118* | .0490 / *1245* |
| 5R | .0050 / *125* | .0075 / *191* | .0160 / *406* | .0040 / *102* | .0060 / *152* | .0600 / *152* | .0150 / *381* | .0115 / *292* | .0460 / *1168* | .0510 / *1295* |
| 5XL | .0050 / *125* | .0075 / *191* | .0200 / *508* | .0040 / *102* | .0060 / *152* | .0100 / *254* | .0150 / *381* | .0115 / *292* | .0500 / *1270* | .0550 / *1397* |
| 6S | .0060 / *150* | .0090 / *229* | .0170 / *432* | .0048 / *122* | .0072 / *183* | .0050 / *127* | .0180 / *457* | .0135 / *343* | .0530 / *1346* | .0590 / *1499* |
| 6R | .0060 / *150* | .0090 / *229* | .0190 / *483* | .0048 / *122* | .0072 / *183* | .0070 / *178* | .0180 / *457* | .0135 / *343* | .0550 / *1397* | .0610 / *1549* |
| 6XL | .0060 / *150* | .0090 / *229* | .0240 / *610* | .0048 / *122* | .0072 / *183* | .0120 / *305* | .0180 / *457* | .0135 / *343* | .0600 / *1524* | .0660 / *1676* |
| 8S | .0080 / *200* | .0120 / *305* | .0225 / *572* | .0064 / *163* | .0096 / *244* | .0065 / *165* | .0240 / *610* | .0170 / *432* | .0710 / *1803* | .0790 / *2007* |
| 8R | .0080 / *200* | .0120 / *305* | .0255 / *648* | .0064 / *163* | .0096 / *244* | .0095 / *241* | .0240 / *610* | .0170 / *432* | .0740 / *1880* | .0820 / *2083* |
| 8XL | .0080 / *200* | .0120 / *305* | .0320 / *813* | .0064 / *163* | .0096 / *244* | .0160 / *406* | .0240 / *610* | .0170 / *432* | .0800 / *2032* | .0880 / *2235* |
| | | ±.0005/*13* | ±.0005/*13* | ±.0010/*25* | ±.0010/*25* | (Ref) | ±.0010/*25* | (Ref) | ±.0010/*25* | |
| 10S | .0100 / *250* | .0150 / *381* | .0280 / *711* | .0080 / *203* | .0120 / *305* | .0080 / *203* | .0300 / *762* | .0200 / *508* | .0880 / *2235* | |
| 10L | .0100 / *250* | .0150 / *381* | .0350 / *889* | .0080 / *203* | .0120 / *305* | .0150 / *381* | .0300 / *762* | .0200 / *508* | .0950 / *2413* | |
| 10XL | .0100 / *250* | .0150 / *381* | .0400 / *1016* | .0080 / *203* | .0120 / *305* | .0200 / *508* | .0300 / *762* | .0200 / *508* | .1000 / *2540* | |
| 12S | .0120 / *300* | .0180 / *457* | .0335 / *851* | .0095 / *241* | .0145 / *368* | .0095 / *241* | .0360 / *914* | .0240 / *610* | .1060 / *2692* | |
| 12R | .0120 / *300* | .0180 / *457* | .0385 / *978* | .0095 / *241* | .0145 / *368* | .0143 / *363* | .0360 / *914* | .0240 / *610* | .1100 / *2794* | |
| 14S | .0140 / *350* | .0210 / *533* | .0390 / *991* | .0110 / *279* | .0170 / *432* | .0110 / *279* | .0420 / *1067* | .0280 / *711* | .1100 / *2794* | Not |
| 14R | .0140 / *350* | .0210 / *533* | .0367 / *932* | .0085 / *216* | .0170 / *432* | .0200 / *508* | .0420 / *1067* | .0200 / *508* | .1100 / *2794* | available |
| 15S | .0150 / *380* | .0225 / *572* | .0330 / *838* | .0090 / *229* | .0090 / *229* | .0150 / *381* | .0450 / *1143* | .0210 / *533* | .1100 / *2794* | |
| 15R | .0150 / *380* | .0225 / *572* | .0390 / *991* | .0090 / *229* | .0090 / *229* | .0210 / *533* | .0450 / *1143* | .0210 / *533* | .1100 / *2794* | |
| 16S | .0160 / *400* | .0240 / *610* | .0352 / *894* | .0095 / *241* | .0095 / *241* | .0165 / *419* | .0480 / *1219* | .0220 / *559* | .1100 / *2794* | |
| 20XS | .0200 / *500* | .0240 / *610* | .0310 / *787* | .0095 / *241* | .0095 / *241* | .0110 / *279* | .0600 / *1524* | .0260 / *660* | .1100 / *2794* | |





| STYLE | | FEED ANGLE |
|---|---|---|
| **3016**<br>**4516** | Inline and 60° "V" Groove | 30°<br>45°<br>60° wire feed available with slimline |

| WIRE SIZE | MATERIAL |
|---|---|
| Specify Wire Size | **W :** Tungsten Carbide Ultra Fine Grain for Aluminum Wire |

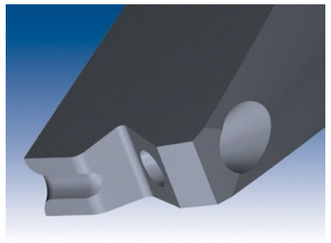
| Tool Dia | TD in / *mm* ±.0001"/*3µm* | TDF in / *mm* ±.0005"/*13µm* | Specified Length | TL in / *mm* ±.005"/*130µm* |
|---|---|---|---|---|
| 1/16 | .0624 / *1.585* | .0570 / *1.448* * | 3/4 | .750 / *19.05* |
| 1/8 | .1249 / *3.172* | .0937 / *2.378* *** | L | .828 / *21.0* |
| 2mm | .0785 / *1.995* @ | .0630 / *1.600* * | 1.00 | 1.000 / *25.4* |
| 3mm | .1180 / *2.997* | .0985 / *2.502* ** | 30mm | 1.181 / *30.0* |

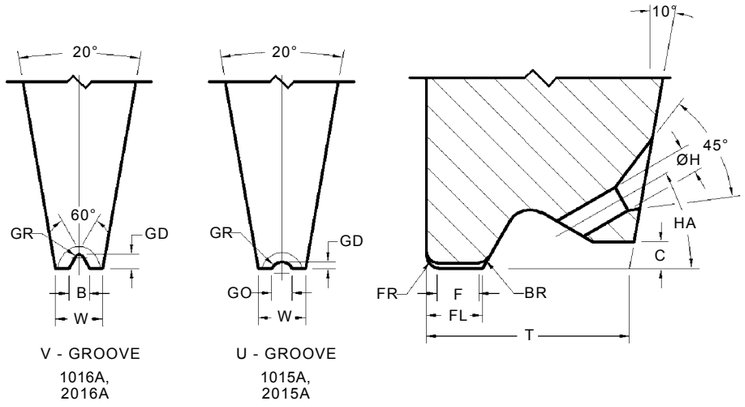
| NOTE | |
|---|---|
| * | limited size availability. |
| ** | .110" / 2.79mm TDF supplied if required by foot geometry. |
| *** | .1180" / 3.00mm TDF supplied if required by foot geometry. |
| @ | Tolerance +0 / - .0002" / 5µm |

| FOOT OPTIONS | |
|---|---|
| **G** | The FR and BR are polished and a fine matte finish is within the area of the groove. (Standard) |
| **GM** | The FR, BR and groove have a matte finish<br>GD = 40% to 60% of wire diameter |

| HOW TO ORDER | |
|---|---|
| **SPECIFY** | **Style - Wire / Foot Size - Material - Tool Diameter - Tool Length - Foot Option**<br>(For modifications to standard tools, use part number and specify modified dimensions or contact our technical support staff for assistance with your requirements). For Shank Style refer to page 62. |
| **EXAMPLE** | 4516 - 5R - W - 3mm - L - GM<br>4516 - 8XL - W - 1/8 - L - G<br>3016 - 12R - W- 1/8 - 1.00 - GM |

## 1015A, 2015A / 1016A, 2016A STYLE






1015A, 1016A HA = 30°
2015A, 2016A HA = 45°

**STANDARD DIMENSIONS**

| Tool Styles | Useable Wire Diameter WD in / *µm* | Hole Diameter H in / *µm* ±.0005/*13* | Foot Length FL in / *µm* ±.0005/*13* | Front Radius FR in / *µm* ±.0005/*13* | Back Radius BR in / *µm* ±.0005/*13* | Flat F in / *µm* (Ref) | Foot Width W in / *µm* ±.0005/*13* | Clearance C in / *µm* (Ref) | Tip Length T in / *µm* ±.0010/*25* | Groove Depth GD in / *µm* ±.0002/*5* | Groove Opening GO in / *µm* ±.0005/*13* |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1015A 2015A | .0030 / *75* | .0045 / *114* | .0090 / *229* | .0018 / *46* | .0018 / *46* | .0065 / *165* | .0075 / *191* | .0040 / *102* | .0350 / *889* | .0009 / *23* | .0032 / *81* |
| | .0040 / *100* | .0060 / *152* | .0120 / *305* | .0024 / *61* | .0024 / *61* | .0090 / *229* | .0100 / *254* | .0040 / *102* | .0400 / *1016* | .0012 / *30* | .0042 / *107* |
| | .0050 / *125* | .0075 / *191* | .0150 / *381* | .0030 / *76* | .0030 / *76* | .0110 / *279* | .0125 / *318* | .0040 / *102* | .0450 / *1143* | .0015 / *38* | .0053 / *135* |
| | .0060 / *150* | .0900 / *229* | .0180 / *457* | .0036 / *91* | .0036 / *91* | .0135 / *343* | .0150 / *381* | .0040 / *102* | .0500 / *1270* | .0018 / *46* | .0063 / *160* |
| | .0070 / *175* | .0105 / *267* | .0210 / *533* | .0042 / *107* | .0042 / *107* | .0155 / *394* | .0175 / *445* | .0040 / *102* | .0570 / *1448* | .0020 / *51* | .0071 / *180* |
| | .0080 / *200* | .0120 / *305* | .0210 / *533* | .0048 / *122* | .0048 / *122* | .0150 / *381* | .0200 / *508* | .0040 / *102* | .0570 / *1448* | .0024 / *61* | .0084 / *213* |
| | .0100 / *250* | .0150 / *381* | .0210 / *533* | .0060 / *152* | .0060 / *152* | .0130 / *330* | .0250 / *635* | .0040 / *102* | .0570 / *1448* | .0030 / *76* | .0105 / *267* |
| | .0120 / *300* | .0180 / *457* | .0300 / *762* | .0072 / *183* | .0072 / *183* | .0210 / *533* | .0300 / *762* | .0060 / *152* | .0880 / *2235* | .0036 / *91* | .0126 / *320* |
| | | ±.0005/*13* | ±.0005/*13* | ±.0005/*13* | ±.0005/*13* | (Ref) | ±.0005/*13* | (Ref) | ±.0010/*25* | ±.0002/*5* | ±.0005/*13* |
| | .0030 / *75* | .0045 / *114* | .0090 / *229* | .0018 / *46* | .0018 / *46* | .0070 / *178* | .0075 / *191* | .0040 / *102* | .0350 / *889* | .0015 / *68* | .0033 / *84* |
| | .0040 / *100* | .0060 / *152* | .0120 / *305* | .0024 / *61* | .0024 / *61* | .0095 / *241* | .0100 / *254* | .0040 / *102* | .0400 / *1016* | .0020 / *51* | .0044 / *112* |
| | .0050 / *125* | .0075 / *191* | .0150 / *381* | .0030 / *76* | .0030 / *76* | .0115 / *292* | .0125 / *318* | .0040 / *102* | .0450 / *1143* | .0025 / *64* | .0055 / *140* |
| 1016A 2016A | .0060 / *150* | .0900 / *229* | .0180 / *457* | .0036 / *91* | .0036 / *91* | .0140 / *356* | .0150 / *381* | .0040 / *102* | .0500 / *1270* | .0030 / *76* | .0066 / *168* |
| | .0070 / *175* | .0105 / *267* | .0210 / *533* | .0042 / *107* | .0042 / *107* | .0165 / *419* | .0175 / *445* | .0040 / *102* | .0570 / *1448* | .0035 / *89* | .0077 / *196* |
| | .0080 / *200* | .0120 / *305* | .0210 / *533* | .0048 / *122* | .0048 / *122* | .0155 / *394* | .0200 / *508* | .0040 / *102* | .0570 / *1448* | .0040 / *102* | .0088 / *224* |
| | .0100 / *250* | .0150 / *381* | .0210 / *533* | .0060 / *152* | .0060 / *152* | .0145 / *368* | .0250 / *635* | .0040 / *102* | .0570 / *1448* | .0050 / *127* | .0110 / *279* |
| | .0120 / *300* | .0180 / *457* | .0300 / *762* | .0072 / *183* | .0072 / *183* | .0220 / *559* | .0300 / *762* | .0060 / *152* | .0880 / *2235* | .0060 / *152* | .0132 / *335* |





| STYLE | | FEED ANGLE |
|---|---|---|
| **1015A** | Inline and “U” Groove | 30° |
| **1016A** | Inline and 60° “V” Groove | 30° |
| **2015A** | Inline and “U” Groove | 45° |
| **2016A** | Inline and 60° “V” Groove | 45° |
| | | 60° wire feed available with slimline |

| WIRE SIZE | MATERIAL |
|---|---|
| Specify Wire Size | **W :** Tungsten Carbide Ultra Fine Grain for Aluminum Wire |

| Tool Dia | TD in / *mm* ±.0001”/*3µm* | TDF in / *mm* ±.0005”/*13µm* | Specified Length | TL in / *mm* ±.005”/*130µm* |
|---|---|---|---|---|
| 1/16 | .0624 / *1.585* | .0570 / *1.448* * | 3/4 | .750 / *19.05* |
| 1/8 | .1249 / *3.172* | .0937 / *2.378* *** | L | .828 / *21.0* |
| 2mm | .0785 / *1.995* @ | .0630 / *1.600* * | 1.00 | 1.000 / *25.4* |
| 3mm | .1180 / *2.997* | .0985 / *2.502* ** | 30mm | 1.181 / *30.0* |

**NOTE**

| | |
|---|---|
| * | limited size availability. |
| ** | .110” / 2.79mm TDF supplied if required by foot geometry. |
| *** | .1180” / 3.00mm TDF supplied if required by foot geometry. |
| @ | Tolerance +0 / - .0002” / 5µm |

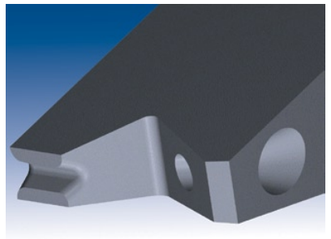
**FOOT OPTIONS**

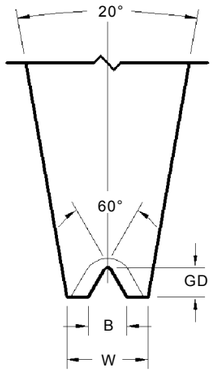
| | |
|---|---|
| **G** | The FR and BR are polished and a fine matte finish is within the area of the groove. (Standard) |
| **GM** | The FR, BR and groove have a matte finish |

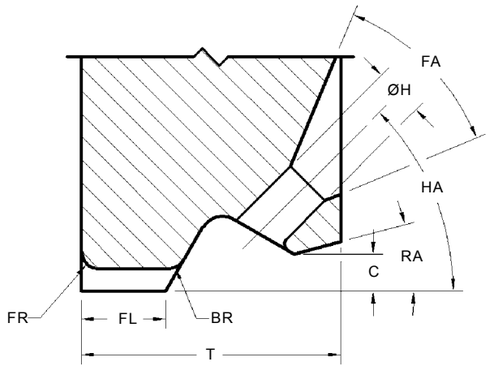
**HOW TO ORDER**

| | |
|---|---|
| **SPECIFY** | **Style - Wire - Material - Tool Diameter - Tool Length - Foot Option**<br>(For modifications to standard tools, use part number and specify modified dimensions or contact our technical support staff for assistance with your requirements). For Shank Style refer to page 62. |
| **EXAMPLE** | 1016A - 5 - W - 3mm - L - GM<br>1015A - 8 - W - 1/8 - L - G<br>2015A-10 - W - 3MM - 1.00-G<br>2016A-12 - W - 1/8-1.00-GM |

## 30D6 / 45D6 / 60D6STYLE






30D6 HA = 30°, FA = 45°, RA = 15°
45D6 HA = 45°, FA = 45°, RA = 15°
60D6 HA = 60°, FA = 30°, RA = 15°

**STANDARD DIMENSIONS**

| Tool Styles | Wire Size | Useable Wire Diameter WD in / *µm* | Hole Diameter H in / *µm* ±.0005/*13* | Foot Length FL in / *µm* ±.0005/*13* | Front/Back Radius FR = BR in / *µm* (Ref) | Foot Width W in / *µm* ±.0005/*13* | Clearance C in / *µm* (Ref) | 30D6 Tip Length T in / *µm* ±.0010/*25* | 45/60D6 Tip Length T in / *µm* ±.0010/*25* | Groove Depth GD in / *µm* Min | Groove Opening B in / *µm* ±.0003/*18* |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 30D6 45D6 60D6 | 75 | .0030 / *75* | .0045 / *114* | .0080 / *203* | .0015 / *38* | .0075 / *191* | .0030 / *76* | .0350 / *889* | .0240 / *610* | .0021 / *53* | .0033 / *84* |
| | 100 | .0040 / *100* | .0060 / *152* | .0105 / *267* | .0020 / *51* | .0100 / *254* | .0030 / *76* | .0390 / *991* | .0350 / *889* | .0028 / *71* | .0044 / *112* |
| | 125 | .0050 / *125* | .0075 / *191* | .0130 / *330* | .0025 / *64* | .0120 / *305* | .0050 / *127* | .0500 / *1270* | .0400 / *1016* | .0035 / *89* | .0055 / *140* |
| | 150 | .0060 / *150* | .0900 / *229* | .0155 / *394* | .0030 / *76* | .0140 / *356* | .0050 / *127* | .0590 / *1499* | .0530 / *1346* | .0042 / *107* | .0066 / *168* |
| | 175 | .0070 / *175* | .0105 / *267* | .0180 / *457* | .0035 / *89* | .0155 / *394* | .0050 / *127* | .0700 / *1778* | .0560 / *1422* | .0049 / *124* | .0077 / *196* |
| | 200 | .0080 / *200* | .0120 / *305* | .0205 / *521* | .0040 / *102* | .0175 / *445* | .0080 / *203* | .0790 / *2007* | .0620 / *1575* | .0056 / *142* | .0088 / *224* |
| | | | ±.0005/*13* | ±.0005/*13* | (Ref) | ±.0005/*13* | (Ref) | ±.0010/*25* | ±.0010/*25* | Min | ±.0005/*13* |
| | 250 | .0100 / *250* | .0150 / *381* | .0270 / *686* | .0050 / *127* | .0215 / *546* | .0080 / *203* | .0900 / *2286* | .0790 / *2007* | .0070 / *178* | .0110 / *279* |





| STYLE | | FEED ANGLE |
|---|---|---|
| **30D6** | Inline and 60° "V" Groove | 30° |
| **45D6** | | 45° |
| **60D6** | | 60° |

| WIRE SIZE | MATERIAL |
|---|---|
| Specify Wire Size | **W :** Tungsten Carbide Ultra Fine Grain for Aluminum Wire |

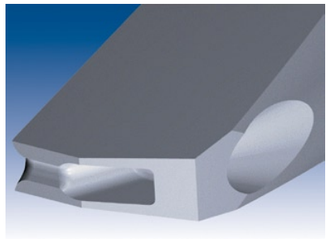
| Tool Dia | TD in / *mm* ±.0001"/*3µm* | TDF in / *mm* ±.0005"/*13µm* | Specified Length | TL in / *mm* ±.005"/*130µm* |
|---|---|---|---|---|
| 1/16 | .0624 / *1.585* | .0570 / *1.448* * | 3/4 | .750 / *19.05* |
| 1/8 | .1249 / *3.172* | .0937 / *2.378* *** | L | .828 / *21.0* |
| 2mm | .0785 / *1.995* @ | .0630 / *1.600* * | 1.00 | 1.000 / *25.4* |
| 3mm | .1180 / *2.997* | .0985 / *2.502* ** | 30mm | 1.181 / *30.0* |

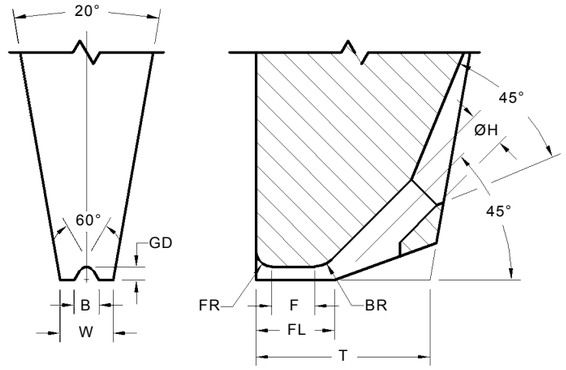
| NOTE | |
|---|---|
| * | limited size availability. |
| ** | .110" / 2.79mm TDF supplied if required by foot geometry. |
| *** | .1180" / 3.00mm TDF supplied if required by foot geometry. |
| @ | Tolerance +0 / - .0002" / 5µm |

| FOOT OPTIONS | |
|---|---|
| **G** | The FR and BR are polished and a fine matte finish is within the area of the groove. (Standard) |
| **GM** | The FR, BR and groove have a matte finish |

| HOW TO ORDER | |
|---|---|
| **SPECIFY** | **Style - Wire - Material - Tool Diameter - Tool Length - Foot Option**<br>(For modifications to standard tools, use part number and specify modified dimensions or contact our technical support staff for assistance with your requirements). For Shank Style refer to page 62. |
| **EXAMPLE** | 45D6 - 250 - W - 1/8 - 1.00 - G<br>30D6 - 150 - W - 3mm - 30mm - G<br>60D6 - 200 - W - 1/8 - 1.00 - GM |

## AB16 STYLE






| STANDARD DIMENSIONS | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Tool Styles - Wire Size / Foot Size | Useable Wire Diameter WD in / µm | Hole Diameter H in / µm ±.0005/13 | Foot Length FL in / µm ±.0005/13 | Front Radius FR in / µm ±.0005/13 | Back Radius BR in / µm ±.0005/13 | Flat F in / µm (Ref) | Foot Width W in / µm ±.0005/13 | Tip Length T in / µm ±.0010/25 | Groove Depth GD in / µm ±.0002/5 | Groove Opening B in / µm ±.0005/13 |
| AB16-3XS | .0030 / *75* | .0055 / *140* | .0039 / *99* | .0024 / *61* | .0036 / *91* | .0015 / *38* | .0075 / *191* | .0220 / *559* | .0015 / *38* | .0033 / *84* |
| AB16-3S | .0030 / *75* | .0055 / *140* | .0049 / *124* | .0024 / *61* | .0036 / *91* | .0025 / *64* | .0075 / *191* | .0230 / *584* | .0015 / *38* | .0033 / *84* |
| AB16-3R | .0030 / *75* | .0055 / *140* | .0059 / *150* | .0024 / *61* | .0036 / *91* | .0035 / *89* | .0075 / *191* | .0240 / *610* | .0015 / *38* | .0033 / *84* |
| AB16-3L | .0030 / *75* | .0055 / *140* | .0069 / *175* | .0024 / *61* | .0036 / *91* | .0045 / *114* | .0075 / *191* | .0250 / *635* | .0015 / *38* | .0033 / *84* |
| AB16-4S | .0040 / *100* | .0070 / *178* | .0064 / *163* | .0032 / *81* | .0048 / *122* | .0030 / *76* | .0100 / *254* | .0300 / *762* | .0020 / *51* | .0044 / *112* |
| AB16-4R | .0040 / *100* | .0070 / *178* | .0084 / *213* | .0032 / *81* | .0048 / *122* | .0050 / *127* | .0100 / *254* | .0320 / *813* | .0020 / *51* | .0044 / *112* |
| AB16-4L | .0040 / *100* | .0070 / *178* | .0094 / *239* | .0032 / *81* | .0048 / *122* | .0060 / *152* | .0100 / *254* | .0330 / *838* | .0020 / *51* | .0044 / *112* |
| AB16-5S | .0050 / *125* | .0090 / *229* | .0080 / *203* | .0040 / *102* | .0060 / *152* | .0040 / *102* | .0125 / *318* | .0380 / *965* | .0025 / *64* | .0055 / *140* |
| AB16-5R | .0050 / *125* | .0090 / *229* | .0100 / *254* | .0040 / *102* | .0060 / *152* | .0060 / *152* | .0125 / *318* | .0400 / *1016* | .0025 / *64* | .0055 / *140* |
| AB16-5L | .0050 / *125* | .0090 / *229* | .0115 / *292* | .0040 / *102* | .0060 / *152* | .0075 / *191* | .0125 / *318* | .0410 / *1041* | .0025 / *64* | .0055 / *140* |
| AB16-8S | .0080 / *200* | .0145 / *368* | .0130 / *330* | .0064 / *163* | .0096 / *244* | .0065 / *165* | .0200 / *508* | .0610 / *1549* | .0040 / *102* | .0088 / *224* |
| AB16-8R | .0080 / *200* | .0145 / *368* | .0160 / *406* | .0064 / *163* | .0096 / *244* | .0095 / *241* | .0200 / *508* | .0640 / *1626* | .0040 / *102* | .0088 / *224* |
| AB16-8L | .0080 / *200* | .0145 / *368* | .0185 / *470* | .0064 / *163* | .0096 / *244* | .0120 / *305* | .0200 / *508* | .0670 / *1702* | .0040 / *102* | .0088 / *224* |
| | | ±.0005/13 | ±.0005/13 | ±.0010/25 | ±.0010/25 | (Ref) | ±.0010/25 | ±.0010/25 | ±.0003/8 | ±.0006/15 |
| AB16-10S | .0100 / *250* | .0180 / *457* | .0160 / *406* | .0080 / *203* | .0120 / *305* | .0080 / *203* | .0080 / *203* | .0760 / *1930* | .0050 / *127* | .0110 / *279* |
| AB16-10R | .0100 / *250* | .0180 / *457* | .0200 / *508* | .0080 / *203* | .0120 / *305* | .0120 / *305* | .0120 / *305* | .0800 / *2032* | .0050 / *127* | .0110 / *279* |
| AB16-10L | .0100 / *250* | .0180 / *457* | .0230 / *584* | .0080 / *203* | .0120 / *305* | .0150 / *381* | .0150 / *381* | .0830 / *2108* | .0050 / *127* | .0110 / *279* |





| STYLE | | FEED ANGLE |
|---|---|---|
| **AB16** | Inline and 60° "V" Groove | 45°<br>60° wire feed available with slimline |

| WIRE SIZE | MATERIAL |
|---|---|
| Specify Wire Size | **W :** Tungsten Carbide Ultra Fine Grain for Aluminum Wire |

| Tool Dia | TD in / *mm* ±.0001"/*3µm* | TDF in / *mm* ±.0005"/*13µm* | Specified Length | TL in / *mm* ±.005"/*130µm* |
|---|---|---|---|---|
| 1/16 | .0624 / *1.585* | .0570 / *1.448* * | 3/4 | .750 / *19.05* |
| 1/8 | .1249 / *3.172* | .0937 / *2.378* *** | L | .828 / *21.0* |
| 2mm | .0785 / *1.995* @ | .0630 / *1.600* * | 1.00 | 1.000 / *25.4* |
| 3mm | .1180 / *2.997* | .0985 / *2.502* ** | 30mm | 1.181 / *30.0* |

| NOTE | |
|---|---|
| * | limited size availability. |
| ** | .110" / 2.79mm TDF supplied if required by foot geometry. |
| *** | .1180" / 3.00mm TDF supplied if required by foot geometry. |
| @ | Tolerance +0 / - .0002" / 5µm |

| FOOT OPTIONS | |
|---|---|
| **G** | The FR and BR are polished and a fine matte finish is within the area of the groove. (Standard) |
| **GM** | The FR, BR and groove have a matte finish |

| HOW TO ORDER | |
|---|---|
| **SPECIFY** | **Style - Wire / Foot Size - Material - Tool Diameter - Tool Length - Foot Option**<br>(For modifications to standard tools, use part number and specify modified dimensions or contact our technical support staff for assistance with your requirements). For Shank Style refer to page 62. |
| **EXAMPLE** | AB16 - 5R - W - 3mm - L - GM<br>AB16 - 8L - W - 1/8 - L - G |

Nearly every desktop computer and server in use today contains one or more hard-disk drives. Every mainframe and supercomputer is normally connected to hundreds of them. You can even find VCR-type devices, portable music players such as MP3 devices, and camcorders that use Hard disks instead of tape. These billions of hard disks do one thing well-they store changing digital information in a relatively permanent form. They give computers the ability to remember things when the power goes out.

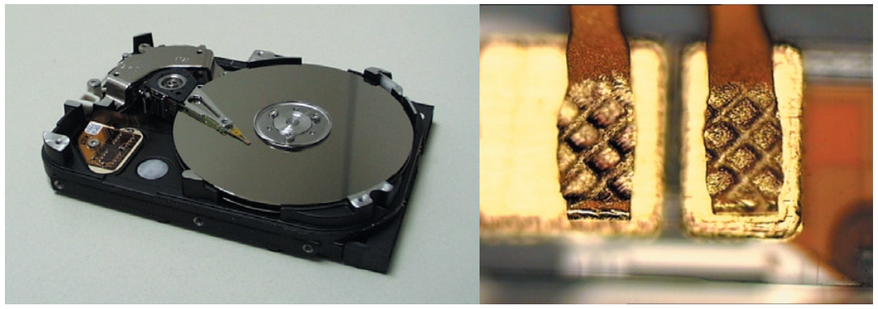
Advancement in Technology has lead to the increase in the storage capacity of the hard disk drive. The evolution towards a smaller slider has challenged the head-gimbal assembly (HGA), and head stack assembly (HSA) processes for new bonding techniques.

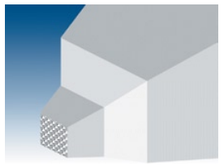
Flexible traces are rapidly replacing wires in the disk drive industry. These traces can be bonded with various tip designs. These bonding tools have been develop by SPT, by using a new innovative molding process to ensure tip to tip repeatability.

The most common tip configuration is the waffle tip design when using molded ceramic material. The groove or protruding (+) or (X) design when using polycrystalline diamond (PCD) tip.

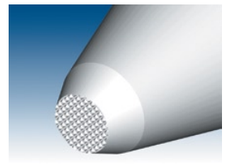
Advantage of using the waffle tool design is for maximizing the transfer of ultrasonic energy during bonding where optimum bonding conditions are not present. In addition, the tool is designed with a 4-sided radius edges for orientation Flexibility. The Shank can be designed to fit wedge or Capillary transducers.

SINGLE POINT-TAB BONDING TOOLS

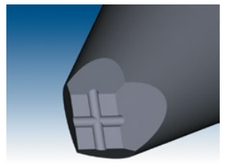




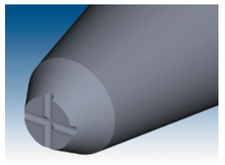
SQUARE WAFFLE FOOT



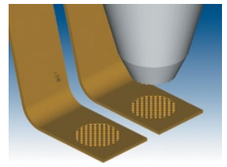
ROUND WAFFLE FOOT



DOUBLE CROSS GROOVE 7000 STYLE



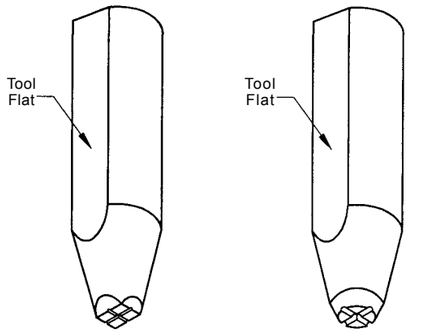
DOUBLE CROSS GROOVE 7100 STYLE



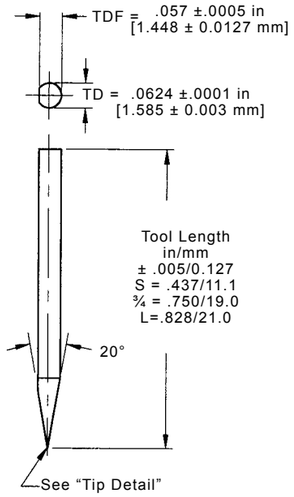
WIRE IMPRESSION

# DOUBLE CROSS GROOVE SINGLE POINT-TAB TOOL

## 7000 / 7100 STYLES

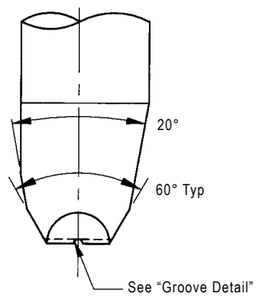


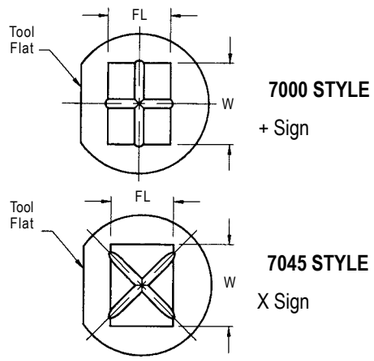

**7000 STYLE** **7100 STYLE**




Other Tool Lengths Available

**TIP DETAIL**

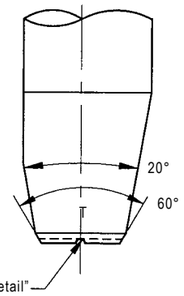


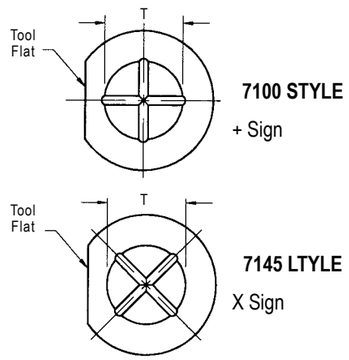




**7000 STYLE**
+ Sign

**7045 STYLE**
X Sign

**TIP DETAIL**

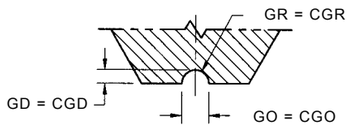



**7100 STYLE**
+ Sign

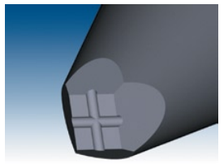
**7145 LTYLE**
X Sign

**GROOVE DETAIL**

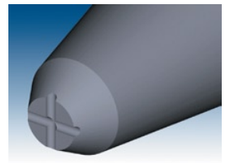





# DOUBLE CROSS GROOVE SINGLE POINT-TAB TOOLS - GENERAL GUIDELINES ON HOW TO ORDER



**DOUBLE CROSS GROOVE 7000 STYLE**



**DOUBLE CROSS GROOVE 7100 STYLE**

| STYLE | | MATERIAL | |
|---|---|---|---|
| **7000 / 7100** | Double Cross Groove | **AZO*** | Molded Ceramic (for high volume) |
| **7045 / 7145** | | **C** | Cermet composite |
| | | **DT** | Diamond Tip |
| | | **M** | Microloy (Osmium-Carbide Alloy) |
| | | **TI** | Titanium Carbide Composite |

| TIP DETAILS | | FOOT OPTIONS | |
|---|---|---|---|
| **W/FL** | Specify "W" and "FL" | **M** | Matte Finish |
| **T** | Specify "T" | | |

| HOW TO ORDER | |
|---|---|
| **SPECIFY** | **Style/Groove Set - Material - W/FL or T - Tool Length - Foot Option** |
| **EXAMPLE** | 7000A- AZO - 4025 - S - M<br>7145B - DT- 0050 - .375- M<br>7045B - TI - 8060 - ¾- M |

**STANDARD GROOVE DIMENSIONS**

| Groove Set | GO = CGO in / *µm* ±.0002/*5* | GD = CGD in / *µm* ±.0001/*3* | GR = CGR in / *µm* (Ref) |
|---|---|---|---|
| A | .0010 / *25* | .0005 / *13* | .0005 / *13* |
| B | .0015 / *38* | .0008 / *20* | .0008 / *20* |

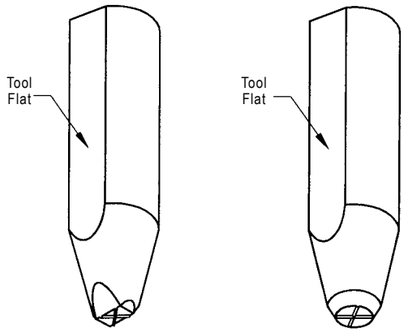
*Include Groove Set call out after Tool Style name to indicate which groove dimensions are desired.*

**STANDARD DIMENSIONS**

| 7000, 7045 Tool Style | | | 7100, 7145 Tool Style | |
|---|---|---|---|---|
| W/FL | Foot Wifth W in / *µm* ±.0002/*5* | Foot Length FL in / *µm* ±.0002/*5* | T | Tip Diameter T in / *µm* ±.0002/*5* |
| 4025 | .0040 / *102* | .0025 / *64* | 0030 | .0030 / *76* |
| 4030 | .0040 / *102* | .0030 / *76* | 0035 | .0035 / *89* |
| 4035 | .0040 / *102* | .0035 / *89* | 0040 | .0040 / *102* |
| 4040 | .0040/ *102* | .0040/ *102* | 0045 | .0045 / *114* |
| 5030 | .0050 / *125* | .0030 / *76* | 0050 | .0050 / *125* |
| 5035 | .0050 / *125* | .0035 / *89* | 0055 | .0055 / *140* |
| 5040 | .0050 / *125* | .0040 / *102* | 0060 | .0060 / *152* |
| 5045 | .0050 / *125* | .0045 / *114* | 0070 | .0070 / *178* |
| 5050 | .0050 / *125* | .0050 / *125* | | |
| 5055 | .0050 / *125* | .0055 / *140* | | |
| 6045 | .0060 / *152* | .0045 / *114* | | |
| 6050 | .0060 / *152* | .0050 / *125* | | |

# DOUBLE CROSS PROTRUSION SINGLE POINT-TAB TOOL

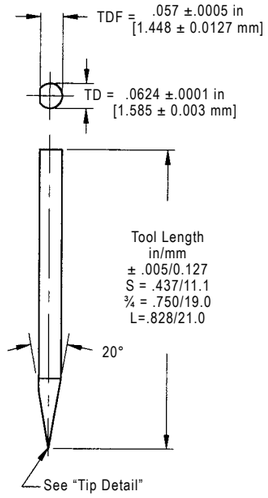
## 7500 / 7600 STYLES




7500 STYLE

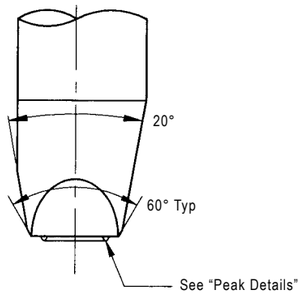



7600 STYLE

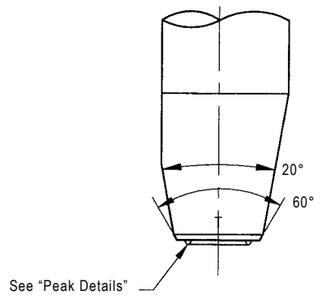


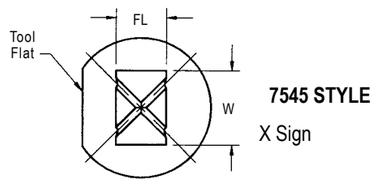

Other Tool Lengths Available

### TIP DETAIL

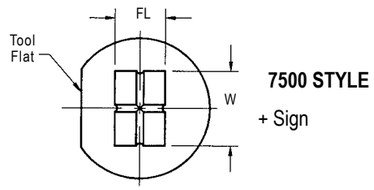



### TIP DETAIL

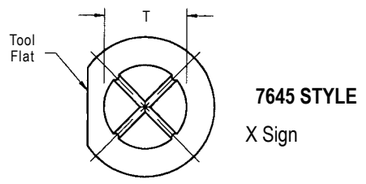


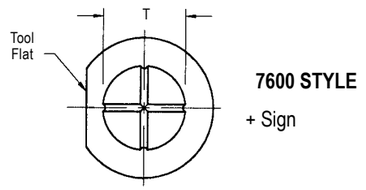

7545 STYLE
X Sign




7500 STYLE
+ Sign

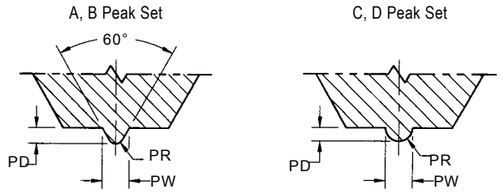



7645 STYLE
X Sign



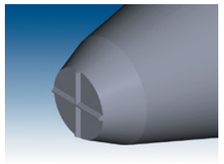

7600 STYLE
+ Sign

### Peak DETAIL






# DOUBLE CROSS PROTRUSION SINGLE POINT-TAB TOOLS - GENERAL GUIDELINES ON HOW TO ORDER



**DOUBLE CROSS PROTRUSION 7500/7600"**

| STYLE | | MATERIAL | |
|---|---|---|---|
| **7500 / 7600**<br>**7545 / 7645** | Double Cross Protrusion | **AZO*** | Molded Ceramic (for high volume) |
| | | **C** | Cermet composite |
| | | **DT** | Diamond Tip |
| | | **M** | Microloy (Osmium-Carbide Alloy) |
| | | **TI** | Titanium Carbide Composite |

| TIP DETAILS | | FOOT OPTIONS | |
|---|---|---|---|
| **W/FL** | Specify "W" and "FL" | **M** | Matte Finish |
| **T** | Specify "T" | | |

| HOW TO ORDER | |
|---|---|
| **SPECIFY** | **Style/Peak Set - Material - W/FL or T - Tool Length - Foot Option** |
| **EXAMPLE** | 7500A - AZO - 4025 - S - M<br>7545B - DT - 8060 - .375 - M<br>7645B - TI - 0060 - 3/4 - M |

**STANDARD PEAK DIMENSIONS**

| Peak Set | Peak Shape | PW in / *µm* ±.0002/*5* | PD in / *µm* ±.0001/*3* | PR in / *µm* (Ref) |
|---|---|---|---|---|
| A | 60° `v' | .0005 / *13* | .0025 / *6* | .0002 / *5* |
| B | 60° `v' | .0008 / *20* | .0005 / *13* | .0002 / *5* |
| C | Radius | .0006 / *15* | .0003 / *8* | .0003 / *8* |
| D | Radius | .0010 / *25* | .0005 / *13* | .0005 / *13* |

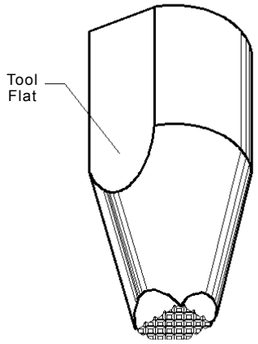
*Include Peak Set call out after Tool Style name to indicate Groove dimensions.*

**STANDARD DIMENSIONS**

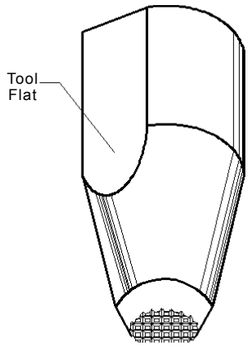
| 7500, 7545 Tool Style | | | 7600, 7645 Tool Style | |
|---|---|---|---|---|
| W/FL | Foot Wifth W in / *µm* ±.0002/*5* | Foot Length FL in / *µm* ±.0002/*5* | T | Tip Diameter T in / *µm* ±.0002/*5* |
| 4035 | .0040 / *102* | .0035 / *89* | 0030 | .0030 / *76* |
| 4040 | .0040 / *102* | .0040 / *102* | 0035 | .0035 / *89* |
| 6035 | .0060 / *152* | .0035 / *89* | 0040 | .0040 / *102* |
| 6040 | .0060 / *152* | .0040 / *102* | 0050 | .0050 / *125* |
| 6050 | .0060 / *152* | .0050 / *125* | 0055 | .0055 / *140* |
| 6060 | .0060 / *152* | .0060 / *152* | 0060 | .0060 / *152* |
| 8040 | .0080 / *203* | .0040 / *102* | 0070 | .0070 / *178* |
| 8050 | .0080 / *203* | .0050 / 125 | | |
| 8060 | .0080 / *203* | .0060 / *152* | | |
| 8070 | .0080 / *203* | .0070 / *178* | | |

# WAFFLE FOOT SINGLE POINT-TAB TOOLS

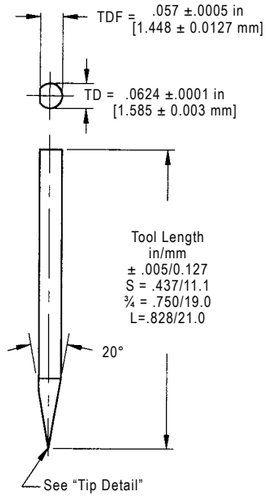
## 7045W / 7145W STYLES



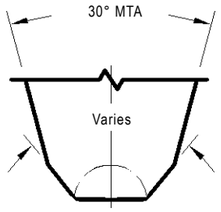

**7045W STYLE**

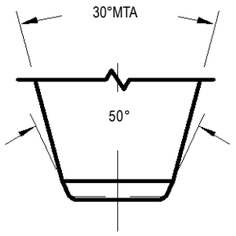


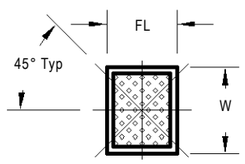

**7145W STYLE**



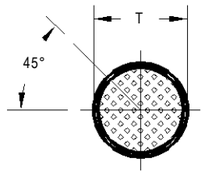

Other Tool Lengths Available



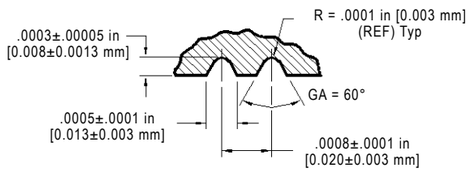




**7045W STYLE**



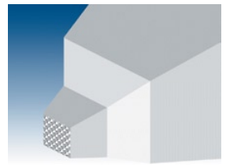

**7145W STYLE**



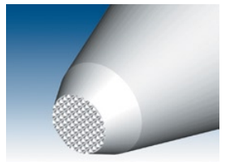

**TYPICAL GROOVE DETAIL**



# WAFFLE FOOT SINGLE POINT-TAB TOOLS - GENERAL GUIDELINES ON HOW TO ORDER



**SQUARE WAFFLE FOOT**
**7045W STYLE**



**ROUND WAFFLE FOOT**
**7145W STYLE**

| STYLE | | MATERIAL | |
|---|---|---|---|
| **7045W / 7145W** | Waffle Tip | **AZO*** | Molded Ceramic (for high volume) |
| | | **C** | Cermet composite |
| | | **DT** | Diamond Tip |
| | | **M** | Microloy (Osmium-Carbide Alloy) |

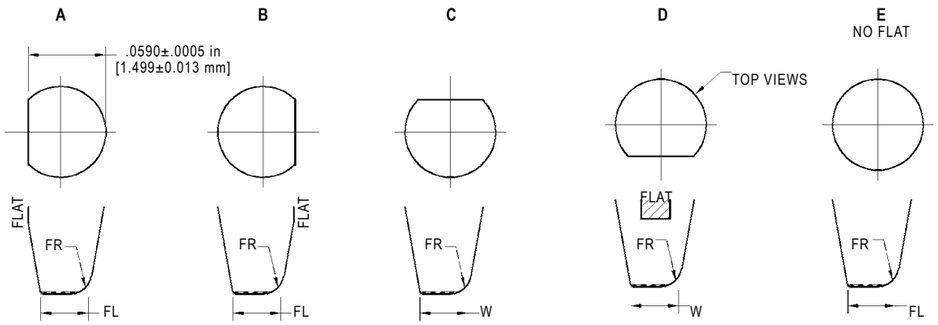
| TIP DETAILS | | FOOT OPTIONS | |
|---|---|---|---|
| **W/FL** | Specify "W" and "FL" | **M** | Matte Finish |
| **T** | Specify "T" | | |

| HOW TO ORDER | |
|---|---|
| **SPECIFY** | **Style - Material - W/FL or T - Tool Length - Foot Finish - Flat Orientation** |
| **EXAMPLE** | 7145W - AZO - 0050 - .375 - M - (Reference Page 60)<br>7045W - DT- 8070 - ¾- M - (Reference Page 60) |

**STANDARD DIMENSIONS**

| 7045 Tool Style | | | | 7145 Tool Style | | |
|---|---|---|---|---|---|---|
| **W/FL** | **Foot Wifth W in / *µm* ±.0002/5** | **Foot Length FL in / *µm* ±.0002/5** | **Shank Style** | **T** | **Tip Diameter T in / *µm* ±.0002/5** | **Flat Orientaion** |
| 5055 | .0050 / *127* | .0055 / *140* | See Page 60 | 0050* | .0050 / *125* | See Chart |
| 6949 | .0069 / *175* | .0049 / *124* | See Page 60 | 0055 | .0055 / *140* | See Chart |
| 7080 | .0070 / *178* | .0080 / *203* | See Page 60 | 0060 | .0060 / *152* | See Chart |
| 7360 | .0073 / *185* | .0060 / *152* | See Page 60 | 0070 | .0070 / *178* | See Chart |
| 7474 | .0074 / *188* | .0074 / *188* | See Page 60 | 0075 | .0075 / *191* | See Chart |
| 8070 | .0080 / *203* | .0070 / *178* | See Page 60 | | | |
| 8090 | .0080 / *203* | .0090 / *229* | See Page 60 | | | |
| 9060 | .0090 / *229* | .0060 / *152* | See Page 60 | | | |

## 7045W WAFFLE TIP




**7045W WAFFLE SHANK FLATS**







## VERTICAL HOLE SHANK - V STYLE, J STYLE, H STYLE, P STYLE

Some wedge bonders position the wire clamp mechanisms above the tool in order to accommodate deep access or tight clearance packages. By moving the clamps above the tool, you can bond closer to the sides of the package or other devices.

The tool itself has a hole running down the center, exiting above the wire feed hole. The angle of the wire feed is usually 45deg or 55deg, in order to minimize the bending of the wire.

*Note : For Delvotec bonders, specify VBL = 060*

**How To Order**: The vertical hole shank style can be ordered by modifying the beginning of the style field in the part number format. Use the letter 'V' to begin the part numbers when you need a vertical hole tool.

| Tool Style | Tool Style with vertical hole |
|---|---|
| UT | VU |
| FP | VF |
| COB | VC |
| M | VM |
| RW | VR |
| ABT | VA |

## SPECIAL CLEARANCE FOR VERTICAL HOLE SHANK - J STYLE

Special Clearance with vertical hole shank is commonly used where deep access is required during bonding to the IC. The double relief allows for maximum clearance of the package while containing the wire in the vertical hole, preventing it to contact the package walls. This prevents wire damage and wire drag which can cause poor looping performance.

**How To Order**: The vertical hole shank style can be ordered by modifying the beginning of the style field in the part number format. Use the letter 'J' to begin the part numbers when you need a vertical hole tool.

| Tool Style | Tool Style with vertical hole (special clearance) |
|---|---|
| UT | JU |
| FP | JF |
| COB | JC |
| M | JM |
| RW | JR |
| ABT | JA |

## DOUBLE FLAT SHANK - H STYLE

Another deep access shank configuration is the double flat shank. The wire is fed from the top of the tool, in between the tool and the transducer, down to the wire feed hole. A clamp presses the wire against the back side of the tool. The wire feed angles are usually 45deg or 55deg.

**How To Order**: The double flat shank style can be ordered by modifying the beginning of the style field in the part number format. Use the letter 'H' to begin the part numbers when you need a double flat tool.

| Tool Style | Tool Style with vertical hole |
|---|---|
| UT | HU |
| FP | HF |
| COB | HC |
| M | HM |
| RW | HR |
| ABT | HA |

## DOUBLE FLAT SHANK, ENHANCED TRANSDUCER CONTACT - P STYLE

A design enhancement of the double flat shank puts a full diameter at the top of the tool where it is mounted to the transducer. This increased tool to transducer contact transmits the ultrasonic energy more efficiently down the tool.

**How To Order**: The enhanced transducer contact design can be ordered by modifying the beginning of the style field in the part number format. Use the letter 'P' to begin the part numbers when you need a double flat tool.

| Tool Style | Tool Style with vertical hole |
|---|---|
| UT | PU |
| FP | PF |
| COB | PC |
| M | PM |
| RW | PR |
| ABT | PA |

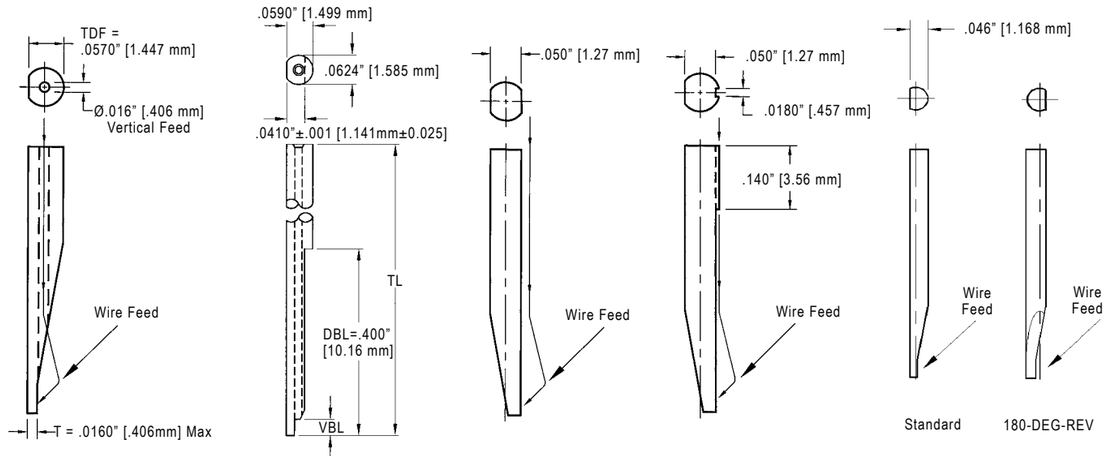
## 180-DEG-REV SHANK

This shank design feeds the wire from the flat side of the tool. Specify '180-DEG-REV' at the end of the part number.

For DIAS wedge bonders and K&S 8060.

Max Ribbon Width .010"

EXAMPLE : FP30A - W - 2520 - .540 - CM
180 - DEG - REV

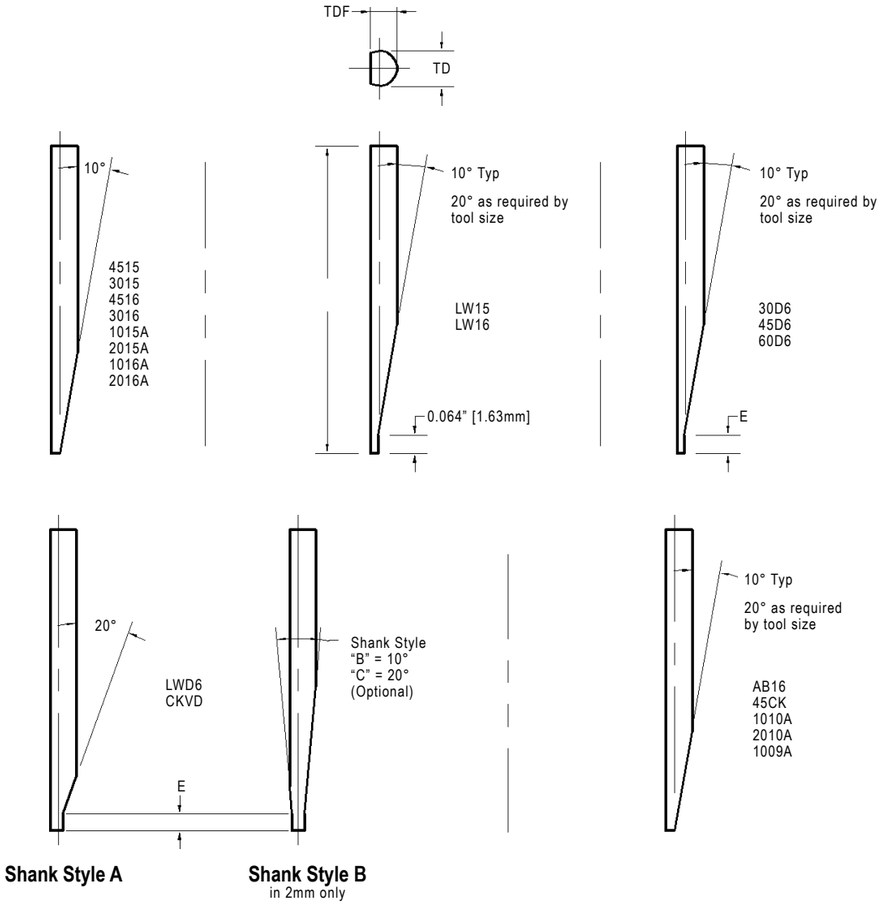



*V Style - Vertical Hole Shank*

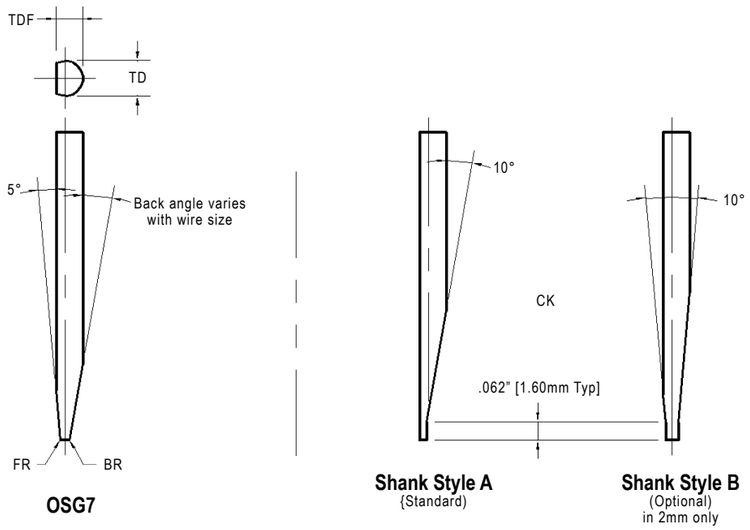
*J Style - Special Clearance for Vertical Hole Shank*

*H Style - Double Flat Shank*

*P Style - Double Flat Shank, Enhanced Transducer Contact*




*Shank Style A used unless specified at end of a part number*




Shank Style A used unless specified at end of a part number

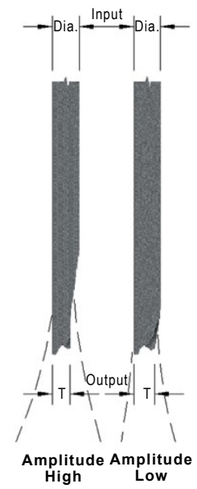




## TIP TO SHANK RATIOS

When selecting a wedge,

* The amplitude of the tools vibration at its foot is a ratio of the input (shank) diameter to the output (foot) diameter..
* Bonding wedges are designed with varying tip-to shank dimensional ratios.
* The smaller the tip the higher the amplitude which will rapidly dampen in contact with the bond surface.
* As the tip grows with the same input amplitude, will vibrate at a comparatively lower amplitude but dampens more slowly, presenting the hazards of over-working the bond.
* In general, larger wire requires more energy to bond than small wire.
* Stiffer wedges works best as wire size increases.



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Department : _____ Contact No : _____ Extn : _____

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## ULTRASONIC Bonding WEDGES Requirement Checklist

Application : _____

Lead Count : _____

Wire Diameter : _____ Material : _____

Bonder / Model : _____

Bond Pad Size : _____

Pad Pitch : _____

Loop Height (target) : _____

Deformed Bond Width : _____

Bond Pad Metallization : _____

Distance between Pad to Lead : _____

Lead Width : _____

Lead Pitch : _____

Lead Metallization : _____

Bonding Temperature : _____

Ultrasonic Bonding Frequency : _____

Present Wedge Part Number(s) : _____

Wire Bonding Top 3 Defects : _____

Any Other Wire Bonding problems? _____

Recommended SPT Wedge Part No: _____



**NOTES :**

## NOTES :

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